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THE JOURNAL OF
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Vol. XIII April, 1922 No. 4

THE RELATION BETWEEN MENTAL AND PHYSICAL GROWTH

BIRD T. BALDWIN

Iowa Child Welfare Research Station, Iowa City, Iowa

A few years ago, I published a study on Physical Growth and School Progress,[1] based on individual growth curves of children. The chief value of these curves consisted in the fact that they were the first to follow consecutively the same groups of children for several years in physical growth, school standing, and the relation of the two. Since the first report I have emphasized in various subsequent investigations the *individualizing method*. This paper presents additional empirical data on the analysis and significance of physical growth curves, the interpretation of similar data on mental growth curves, and the relation between mental and physical growth.

Physical Growth Curves

At present I have data at hand on approximately 2500 individuals for 30 physical traits with consecutive measurements on nude children for periods of from 18 to 24 semi-annual intervals. These boys and girls have had systematic medical inspection, directed play, physical training, and those falling outside a normal growth zone on account of disease history or abnormal growth have been eliminated. If one of these specific physical traits is selected, growth in standing height for example, the curves show a number of individual characteristics and definite basic principles of growth for different types of children.[2]

For growth in height, the curves show that the boys are as a rule taller than the girls, except from approximately 11½ to 13½ years of age, the girls reaching their final height earlier than the boys. For

[1] Published by U. S. Bureau of Education, 1914, No. 10, pp. 215.

[2] Baldwin, B. T.: The Physical Growth of Children from Birth to Maturity. *Iowa Child Welfare Studies*, No. 1, 1921 (1), pp. 412.

both boys and girls the curves fan out, showing a wider range of distribution as the chronological ages increase from 4 to 18 years. The pubescent acceleration, when present, appears earlier for the girls than for the boys, usually preceded by a slight retardation. At the adolescent acceleration the curves approximate in appearance a series of concentric arcs, with the acceleration appearing earlier in the taller children (the upper arch) than in the shorter. Since the curves assume in general a railroad appearance, each boy and girl holds his or her relative position in the group for the ages from 4 to 18, with little crossing of the curves. The maintaining of the same relative position of individuals within a group permits for the first time the scientific approach to the problem of physical growth in height from the standpoint of *prediction*.

Prediction in Physical Growth

The degree to which prediction is possible measures in a very definite way the development and practical application of a science. For example, the prediction of physical and mental growth enables one to determine whether children are advancing at a normal rate. If it is found that they are not, remedial measures may be taken to accelerate growth or prevent over-stimulation. The significance of any increment of growth, physical or mental, depends fundamentally on what the status at later periods should be, the size of the increment being conditioned by the physical or mental type of the individual. Tall, medium and short children grow differently, with characteristic physiological stages of maturation which later affect the rate and completion of growth but do not affect relative ranking within a group.

This large series of long-time individual growth curves for different types of children enables us to predict what will be the later status of children who have been measured at the early ages. One method of doing this is to identify a child with one of the types of curves and estimate what his later development would be. Also, since the increments for growth from one chronological age to the next or between definite stages of physiological ages have been computed for a wide range of type growth curves, we can predict what should be the increment at any later period for a child who has been measured only a few times. So again, knowing that a boy of the average type at 7 years of age has gained 70.3 per cent of his final growth at 17 years of age, and a girl 74.2 per cent of her final growth, we can predict what the ultimate stature of a similiar child should be. These three methods

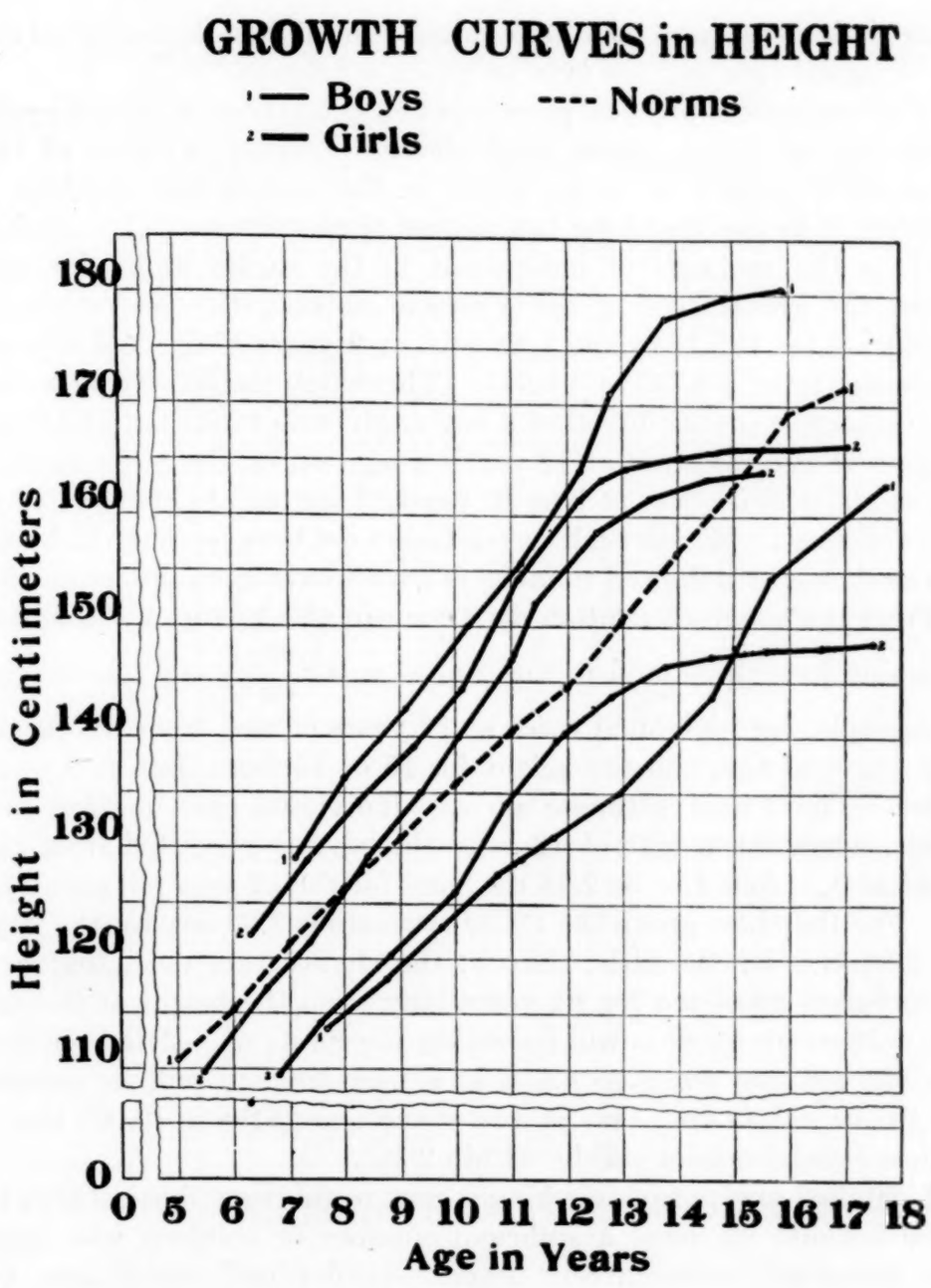
GROWTH CURVES in HEIGHT
1 — Boys
2 — Girls
---- Norms
Height in Centimeters
180
170
160
150
140
130
120
110
0
0 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Age in Years

CHART I

of prediction are based on a knowledge of the child's chronological and physiological ages and the type to which it belongs.

The evenness of physical growth in height has been indicated by the parallelism of the curves as cited above. Further evidence of this evenness of growth is to be found in the subsequent rankings of individuals in the group by the *method of correlation*. This method gives us the rankings of individuals in the earlier and later ages within the group. Using the Pearson method, the coefficients of correlation for 125 boys and girls at 6 or 9 years of age and 6 years later range from +0.735 to +0.944. These high coefficients show that there is a great probability that a boy or girl who ranks tall at 6 years of age will also rank tall at 12 years of age, or, on the other hand, a boy or girl who is short at 9 or 10 years of age will be short at 15 or 16 years of age. Similar high correlations exist between birth and later ages as shown by a limited number of curves extending into adult life.

From the above correlation data one can also predict by using the regression formula (found in Yule) $y_1 - y = r\frac{\sigma y}{\sigma x}(x_1 - x)$ the height, for example, for individual cases at 12 years of age, from the height at 6 years of age, and the height for 15 or 16 from that at 6 years earlier. The PE of estimate on any individual case in these two groups, when the height of 12 year old boys is predicted from the height at 6, is found to be 2.98 cm., and for the 12 year old girls 2.58 cm. For the older group the PE of estimate is 2.09 cm. for the boys and 2.81 cm. for the girls; that is, the chances are even that any measurement predicted for six years later from the height at the age of 9 or 10 years for girls will lie within the limits of +2.81. In this case, the chances are 1 to 4.5 that a measurement will lie outside of 2 PE or ±5.62 cm., that is, the chances are 8198 in 10,000 that a predicted measurement will be within 2 PE.

A detailed analysis of this kind is now possible on physical growth curves because we have a sufficient number of children who have been measured consecutively under standardized conditions by uniform methods and by a uniform scale. No such complete data exist on mental development. Nevertheless, with certain material recently obtained it is possible to follow the general method that has been outlined. The detailed analysis of these data is given in a study[1] now in press by B. T. Baldwin and Lorle I. Stecher.

[1] The Mental Growth Curves of Average and Superior Children. *Iowa Studies in Child Welfare*, No. 1, Vol. II, 1922, pp. 59. (In press.)

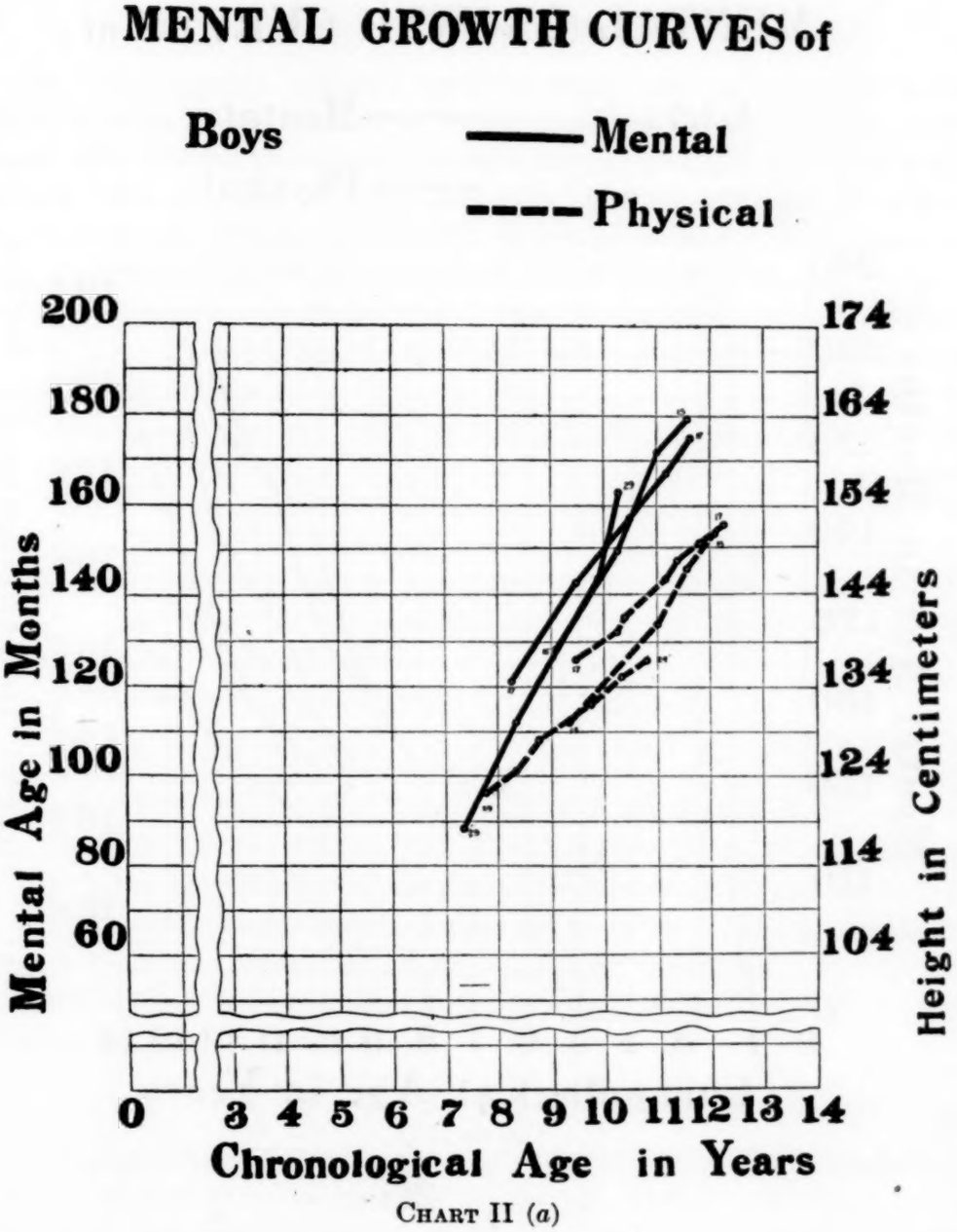
MENTAL GROWTH CURVES of
Boys
Mental
Physical
200
180
160
140
120
100
80
60
Mental Age in Months
174
164
154
144
134
124
114
104
Height in Centimeters
0
3 4 5 6 7 8 9 10 11 12 13 14
Chronological Age in Years

CHART II (*a*)

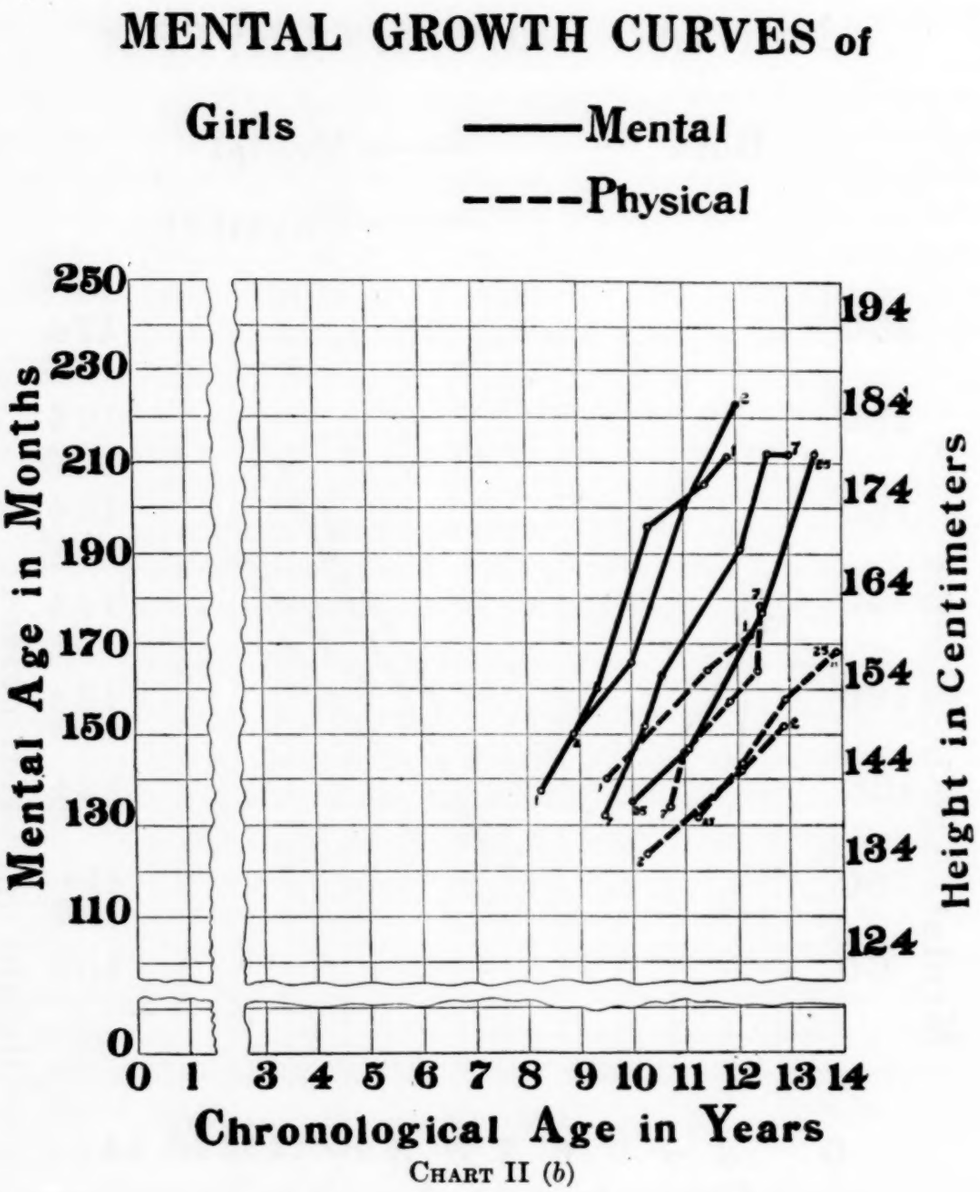
MENTAL GROWTH CURVES of
Girls
——Mental
----Physical
Mental Age in Months
250
230
210
190
170
150
130
110
0
Height in Centimeters
194
184
174
164
154
144
134
124
0 1 3 4 5 6 7 8 9 10 11 12 13 14
Chronological Age in Years

CHART II (*b*)

Mental Growth Curves

In 1917, several hundred children were examined at the Iowa Child Welfare Research Station by the Stanford Revision of the Binet Scale, with a view to obtaining subsequent individual mental growth curves. On account of war conditions and the shifting of school population, the number of cases for this purpose has been reduced to 143, of whom 42 have had 4 examinations and 36 additional cases have had 5 consecutive examinations. The individual mental growth curves have been plotted. Chart II gives a few individual physical and mental growth curves.

Chart III shows the mean mental growth curves of average and superior boys and girls. The mental examinations on which these growth curves are based were made at irregular intervals. In order to plot the curve at the customary one year intervals, the mental ages, in place of being assigned to the year nearest the chronological age, as is usually done, were re-calculated by using directly the rate of improvement which had existed just before and after the chronological age included within this interval.

The curve does not extend beyond 14 years. These superior and average children develop at different levels and grow increasingly dissimilar with age. This divergence in growth curves of average and superior children has been assumed as probable, but has not here-to-fore been empirically demonstrated. There is, it will be noted, a change in the trend in the curve at the approach of adolescence. This is especially noticeable in the curve for the girls. The superior children show this acceleration about one year earlier than the average children.

Prediction in Mental Growth

Consequently, if we know the growth history of a sufficient number of children, we can tell from these individual curves what should be the later status of children of the same type who have received only the earlier measurements. The results in Chart IV also show that the IQ is only approximately constant upon successive examination. The girls present a greater irregularity in development than the boys in this group. Using again the method of correlation for predicting relative ranking in mental growth, the coefficient between the first IQ and the fifth IQ is +0.82 for the boys and girls, which indicates that they keep their relative positons after an interval of approximately 4 years. For larger groups with fewer repeated exam-

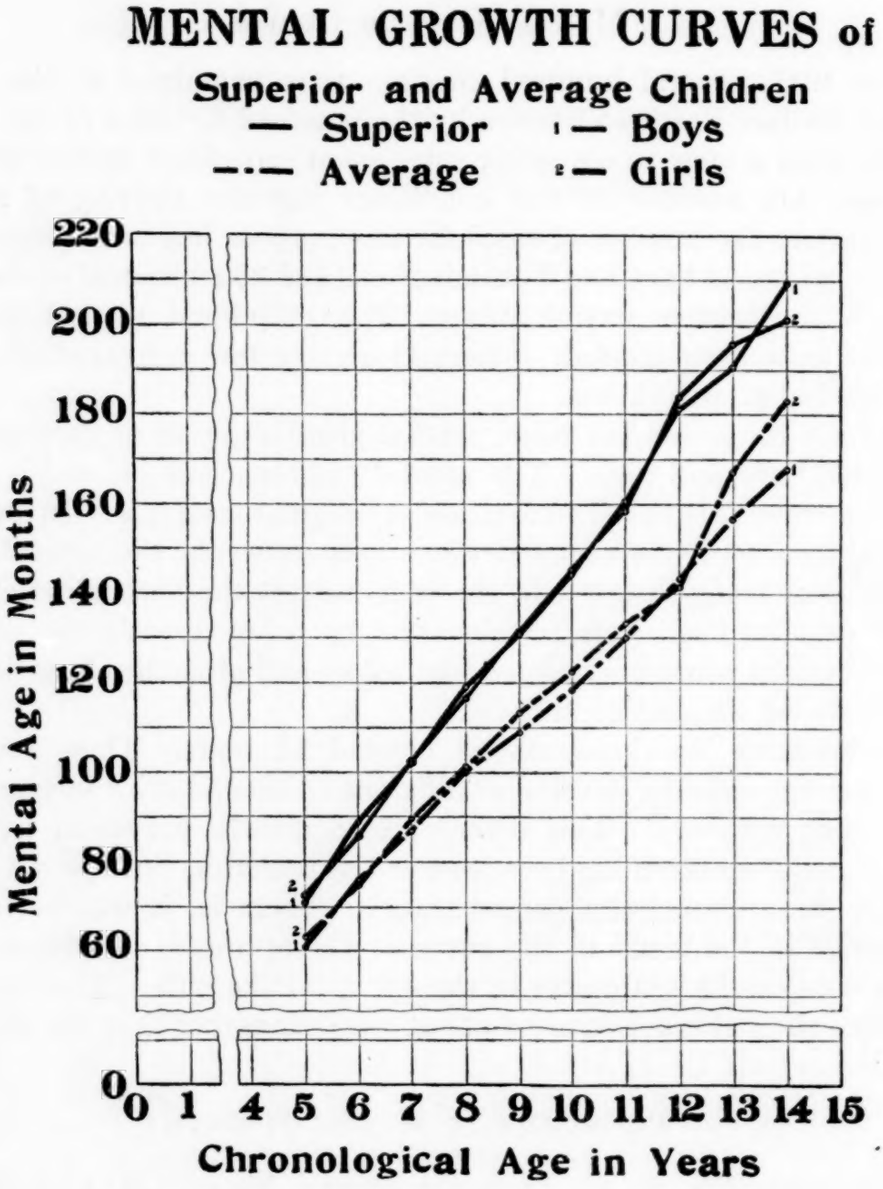
MENTAL GROWTH CURVES of
Superior and Average Children
— Superior
-·— Average
1 — Boys
2 — Girls
Mental Age in Months
220
200
180
160
140
120
100
80
60
0
0 1 4 5 6 7 8 9 10 11 12 13 14 15
Chronological Age in Years

CHART III

inations, the coefficients range from +0.69 to +0.93, the near-lying examinations having higher coefficients as a rule. In most instances two examiners did all of the testing; in a few, four, but the number of examiners has little effect on the correlation.

From the four coefficients of correlation involved for the five series of IQ's, the PE of estimate obtained by means of the regression equation for the prediction series of the second from the first IQ equals 4.2 points; the third from the first, 7 points; the fourth from the first, 6.2 points; and the fifth from the first, 5.5 points. The mean time intervals were 13, 28, 36 and 41 months respectively.

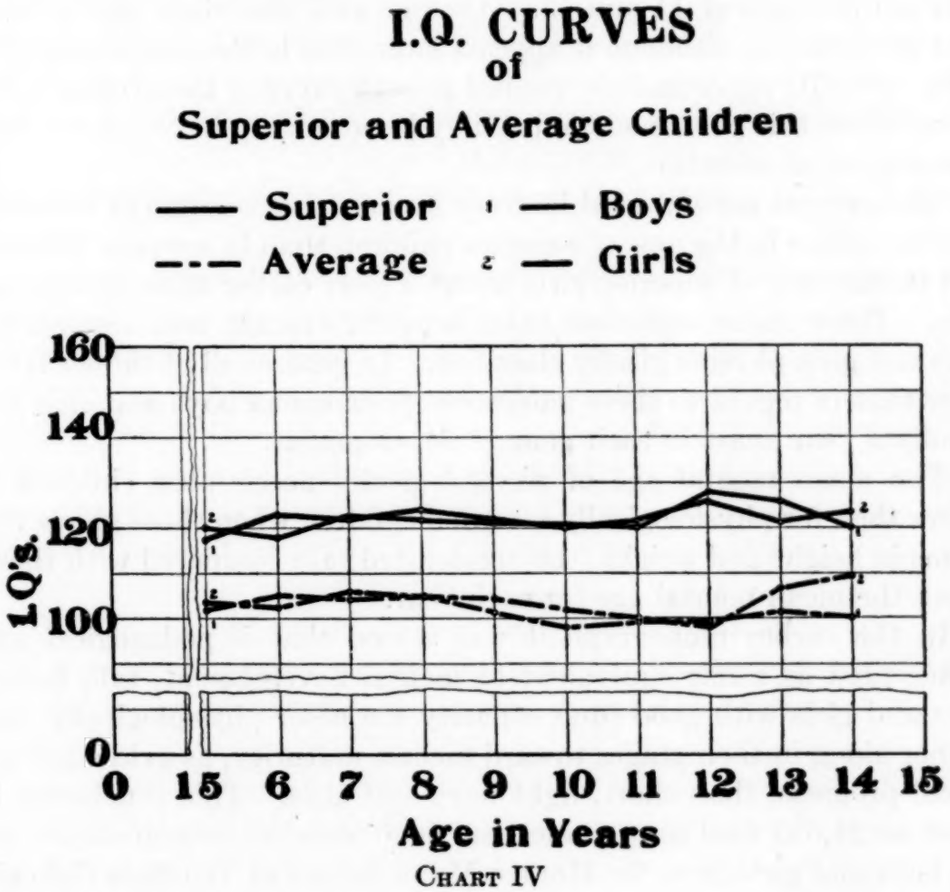

CHART IV

It is not possible from the data at hand to make an exact determination of the amount of error of prediction for various intervals of examination, since all of the children in this group have had repeated measurements, which influence, no doubt through practice, the size of the correlation for the longer intervals. In order to determine how accurately one may predict a child's IQ at one year or two years later,

the correlations will have to be obtained on a sufficient number of children at each examination interval without intervening periods. In the absence of such long time data, one can say that it is possible to predict a child's IQ with a PE of from 4 to 7 points.

The Relation Between Physical and Mental Growth

It is apparent from the charts that certain phenomena associated with physical development show themselves in a decrease or increase in the mental age and in the IQ at certain chronological ages. Both superior boys and girls show a rise in the mental age and in the IQ's between the ages of 11 and 12. Average girls also show this adolescent acceleration, although it appears later than in the case of superior girls. The IQ curve and the mental growth curve of the average boys do not show this phenomenon, possibly because they have not reached the stage of acceleration.

The general pre-pubertal increase in mental development becomes evident earlier in the case of superior children than in average children and in the case of superior girls about a year earlier than in average girls. These same contrasts exist between average and accelerated boys and girls physiologically classified. In general all of these curves show that in regard to these adolescent phenomena boys and girls are usually a year apart in their general development.

The mean mental age of physiologically accelerated children is higher than for physiologically retarded children when those above the norms in height and weight (the accelerated) are compared with those above the mean mental age for each year.

In the earlier monograph it was stated that if pedagogical age be accepted as a fair equivalent to mental development, tall, heavy boys and girls with good lung capacity are older physiologically and further along in their stages toward mental maturity, as evidenced by school progress, than short, light boys and girls. This conclusion is based on 21,682 final term grades and 5000 physical measurements on 125 boys and girls from the Horace Mann School at Teachers College, Columbia, University, and The Francis Parker School in Chicago.

Since the first study of the inter-relation between physical and mental growth, as shown by school progress, this work has been continued by taking the measurements of height, weight and total area of carpal bones of the same children, who were examined by the Stanford Revision of the Binet Scale at Iowa City. The correlations between these physical and mental traits for 49 girls, for example, are, for

height and mental age +0.89; for weight and mental age +0.71; for exposed area of carpal bones and mental age +0.83 as shown in the Baldwin-Stecher Study.

The size of the correlations is unduly influenced by the range of the ages of the children of this group, which is from 5 to 15 years. The correlations for the physical traits previously stated are based on relatively large numbers of children of the same chronological ages. The correlations between IQ's are probably not subject to criticism from this point of view, since the IQ compensates in a measure for the differences in the chronological ages.

Growth in height shows in all of our studies a high correlation with physiological age, or stages of physiological maturity, when various criteria of this age are used. On the average, weight correlates with height +0.809 for boys and +0.603 for girls at any two subsequent ages from 7 to 17. The inter-correlations of physical traits are consistently higher for boys; the coefficients of variability are also higher for boys.

The coefficient for the group of 49 girls by the method of partial correlation (with age constant) is between height and weight +0.57; between height and *x*-ray +0.52. For height and mental age the coefficient is +0.53. That is, physiologically accelerated girls (and the same holds true of boys) are mentally accelerated. The mental acceleration includes both stages of mental maturity and brightness, since the scale does not differentiate between these two distinct phases of mental growth. As I pointed out in 1914, no scale can accurately measure mental growth which does not take into consideration individual differences in physiological age for children of the same sex and the same chronological age. A thorough-going program for investigating the relation between mental and physical growth would require consecutive mental and physical examinations on a large group of children at regular intervals, with uniform methods and standardized scales for mental and physical maturity and intelligence. This would necessitate a tri-dimensional scale in place of our mental chronological age scales. The day for the study of physical growth processes by single measurements is over. They can tell us little or nothing that is not already known. The day for basing a study of *mental growth processes* on snap-shot cross-section group or individual examinations will soon be over. Let us begin to do what should have been done long ago, *i.e.*, plan consistently to make *intensive consecutive studies throughout a series of years on the same individuals.*

PITFALLS IN RATING SCHEMES

FREDERIC B. KNIGHT
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AND
RAYMOND H. FRANZEN
Research Director, Des Moines Public Schools

When subjects rate themselves or others for several qualities, certain tendencies (probably unconscious) are present which make it necessary to be on one's guard in the interpretation of the ratings. Two such tendencies will be reported in this article. Results of introspection generally, and ratings are of value only when these are interpreted as behavior and not as truthful accounts. If "A" reports that he thinks something, *that* is important irrespective of whether he really thinks it or not. The conflict between introspective and behavioristic psychology is not in the data obtained, but in the way the data are interpreted.

I. Pitfalls in Rating Schemes

In the ratings of an individual upon himself in comparison with others in a group, there is a marked tendency of the individual to overrate himself. This as far as we know is commonly assumed theoretically but actual data on the point are scant.

In the spring of 1921 we had 110 junior students in a university rate in *order of importance to themselves* a list of interests varying in character from the essential to the trivial. Samples of these interests are,—pleasing one's parents, dancing, the movies, development of character, magazine reading, the church, dress, and health. There were 34 interests in all.

The setting up of an order of interest on a basis of the pooled returns was perfectly feasible. Such an order of interests may be thought of as the relative importance of interests of typical juniors *when the ratings are taken introspectively*, or the order of interests of a typical junior *as he thinks he is*. We then had the same juniors rate these interests for the ideal junior. This then is the order of interests as the junior thinks it should be. The correlation between these two orders of interests was +0.46.[1] There is, then, a tendency for the junior to think he is as he should be. Later we had the same group rate these interests "in order of importance to the typical junior." The pooled

[1] Pearson Correlation Coefficient.

rating from these data may be thought of as the relative importance of interests of the typical junior when the ratings are taken objectively, or the order of interests in the junior as he is seen by his classmates. The correlation between this order of interests and the "ideal one" was −0.64. There is, then, a tendency for the junior to think his fellow-juniors are *not* what he believes they should be. The correlation between the order of interests taken introspectively and that taken objectively was +0.13. Then there is very little association between what the junior thinks he is and what others think he is. He is a very bad judge of himself. Thus students place themselves between the ideal and the typical fellow student. There is a higher association between what they believe they are and what they would like to be than between what they believe they are and what their fellow students believe they are. Students when rating themselves are, in their own opinion, nearer the ideal in their order of interests than they think their fellow students are. But, when 110 juniors rate their own interests, the resulting pool *is* that of the typical junior. Thus the very low correlation between the order of interest taken introspectively and the order taken objectively cannot be accounted for by difference of facts. It is due to difference in the point of view of the rater. Each believes he is to some extent the ideal of the group but he does not extend this courtesy to his fellows. There is in self-rating, for junior students at least, a marked tendency to overrate themselves or underrate their fellows, which amounts to the same thing as far as comparisons are concerned. Undoubtedly there is a self-defense mechanism at work in self-ratings. Just what the fluctuations of this tendency are is unknown.

We think that this tendency to overrate one's self and the extent to which any one individual does it has possible diagnostic value quite apart from the truth or falsity of the ratings themselves.

The following orders of interest have been obtained from each individual:

1. His order of interests as he envisages them.
2. The order of interests he believes to be typical of the group of which he is a member.
3. The order of interests which he believes to be ideal for himself.

The corresponding orders of interest obtained for the group by pooling those of the members of the group are:

4. The average order of introspective origin.
5. The typical order as the group judges it.

6. The ideal order the group judges it.

Many valuable diagnoses of traits are yielded by the intercorrelations of these orders and by the partials. The most important of these are:

(*A*) The amount and direction of the correlation between 1 and 2 indicate the attitude of the individual on the question of whether or not he likes what others like. If the order of interests as an individual believes them to be in himself correlates positively and highly with the order he believes to be typical he judges himself to be a normal human being. If this correlation is negative and high, then he believes himself to be "different." The value of knowing an individual who judges himself as being different or "funny that way" is of obvious import to the diagnosis of mental peculiarity and mental disease.

(*B*) The amount and direction of the correlation between 1 and 3 indicate the degree to which he believes himself to be what he wants himself to be. A high positive correlation between a person's ideal order and what he reports as his own actual order might mean a well-satisfied person, *i.e.*, he believes his values to be in the order of importance which constitute his ideal. If we could further determine that his interests were actually not in this order by finding how much he went to the movies, etc., then he would be smug. A low or negative correlation could be taken to mean that the person was either very humble or had a feeling of failure or imperfection. In this case he would be saying, "I know what the relative importance of my values ought to be, but they actually are the opposite."

(*C*) The combination of interpretation of the correlations of 1 with 6, 2 with 6, and 3 with 6 yield an insight into the conceit and sentimentality of the individual. If the correlation of 1 with 6 is positive and high and the correlation of 2 with 6 is low or negative, then the individual certainly is conceited (though we do not know whether he has reason to be or not). If the correlation of 2 with 6 is higher than 1 with 6, we can say he is not very much impressed with himself (though he may have or may not have reason to be). These conclusions do, however, in part depend upon the correlation of 3 with 6, since, if the individual did not subscribe to the order of interests called ideal by the group, his feeling that he was like that would constitute no boast. If, however, the correlation of 1 with 6, and 2 with 6 are both high—say as high as 3 with 6—it shows a naive sentimentality, since it indicates that the individual is calling "typical" what the group calls "ideal." We define sentimentality as theoretical evaluation, hence judgment in terms of desire, not evidence.

(*D*) Different amounts of agreement between 2 and 3, an individual's ideal order and the order he thought the typical had, could mean if the correlation were high and positive a general optimism, *i.e.*, he judges that people have about the relative order of interests that they ought to have. If the correlation was low or negative a critical or even cynical attitude would be suggested, *i.e.*, a feeling on the part of the reporter that whatever else might be true of people, they have values in the wrong order.

(*E*) If there were in any specific situation a negative correlation between 2 and 5, the order of the typical as judged by the subject, and the *actual* order of interest of the group, the recognition of this by a reporter would imply a clear sightedness which many assume, but few possess. An instance of this is: A certain professor was asked to rate the interests as juniors would report them. His rating correlated with our pooled order—58. Another professor rated the interests as he thought they would be rated by juniors. His rating correlated $r=0.89$ with our pooled rating. It seems fair to assert that the second professor knows the student and that the first does not.

(*F*) In the case of the amount of agreement between 3 and 6, the ideal order of interests in the opinion of an individual and the ideal order of interests derived from pooling the ratings of the group, a high positive correlation would suggest that the reporter had values about like the group. Low or negative correlation would suggest at least one important deviation of the individual from his group.

Taking the six orders of interests thus derived: An individual's rating of himself, of his idea of the typical, of his ideal, and these three orders pooled—a study of all the inter-relations on a correlation basis contains many valuable tips for those concerned with character analysis devices.

Another attempt to get the amount of agreement between order of interests taken introspectively and objectively was made with a second group of juniors (71 cases). In the first attempt the interests were rated in order 1 to 34. The correlations may have been lower because the difficulty of the task may have acted as chance error. If this is true, then the low correlations which we have used to prove a tendency of over-rating would change as the difficulty of the experiment was lessened.

In the second attempt we had the group assign values of *A*, *B*, *C*, *D* and *E*,—*A*, for the most important or strongest. The reporters were cautioned to distribute the marks in conformation with the normal

curve in so far as such distribution did not conceal their genuine opinion. The interests were the same as before and order of importance for one's self, the typical junior, and the ideal were obtained.

The following table will show that the disagreement between the

DISTRIBUTION OF JUDGMENTS ON RELATIVE IMPORTANCE OF INTERESTS
Column under *I* is the ideal rating; *S* is the order of importance of interests taken introspectively; *T* is the reports taken objectively. Where too few votes are recorded for comparative purposes none are printed. *A* is strongest interest. *F* is weakest.

	A			*B*			*C*			*D*			*E*			*F*		
	I	*S*	*T*	*I*	*S*	*T*	*I*	*S*	*T*	*I*	*S*	*T*	*I*	*S*	*T*	*I*	*S*	*T*
Parents	23	17	9	8	11	12	2	2	13									
Politics	...	...	...	11	2	1	16	3	11	3	7	8	1	6	10	1	13	3
Dancing	0	1	13	0	7	14	19	15	7	9	5	0	5	3	0			
Children	...	...	...	13	9	5	14	12	10	4	7	6	1	3	7			
Social approval	6	8	18	14	12	12	11	9	3									
Business	...	...	...	20	2	3	9	10	11	3	8	7	0	6	8			
Personal appearance	4	5	7	18	17	22	9	10	4									
Driving a car	...	...	...	3	8	14	13	10	14	9	3	3	5	4	1	3	7	0
Friends	8	5	9	23	21	18	3	5	5									
Sorority	0	2	12	8	13	15	18	4	3	5	4	4						
Art	...	...	...	17	8	4	13	9	11	3	8	12	0	3	4			
Music	0	6	0	19	13	2	13	10	16	1	2	10						
Home	16	15	2	11	8	7	4	6	18	1	3	4						
Athletics	...	...	...	9	5	10	19	15	17	3	3	3	1	4	3			
Studies	9	4	0	19	18	7	3	9	19	2	1	5						
Sleeping	...	...	...	15	4	5	13	14	22	10	6	3	4	6	2			
Social entertainment	...	...	...	3	7	18	23	15	11	5	5	0						
Society	...	...	...	10	4	10	19	10	14	1	6	7	2	7	1			
Health	15	11	1	6	14	8	3	9	15	0	1	6						
Character	26	13	5	7	17	11	1	2	12									
Dress	1	2	6	14	18	18	17	10	9									
Men	0	1	9	8	8	18	15	15	4	6	5	3						
Theatre	...	...	...	3	9	7	18	16	15	7	6	5						
Church	14	2	0	13	6	0	6	14	11	1	6	14	0	3	6			
Eating	...	...	...	1	3	6	21	20	18	6	2	5	4	4	1			
Education	11	4	0	18	20	10	5	8	13	0	0	8						
Reading	5	4	0	23	8	6	5	17	14	0	3	8	0	1	6			
Laughing	...	...	...	9	9	16	20	12	13	3	3	3	0	6	2			
Domestic duties	...	...	...	7	3	0	17	10	7	7	10	12	2	7	7	0	1	7
Magazines	...	...	...	8	6	6	16	10	17	7	12	5	1	2	3			
Travel	5	9	2	14	9	10	14	7	11	0	3	6						
Movies	...	...	...	2	5	15	12	11	9	11	9	3	6	7	0			
Garden	...	...	...	2	2	0	14	3	0	8	0	4	7	10	7	2	18	23
Economy	8	1	0	15	9	1	9	9	11	0	7	9	1	3	7	0	2	6

In 80 instances the self rating was between the *ideal* and the *typical*.

In 39 instances the self rating was not the middle rating. Thus taking the *A* column and the row giving ratings on Parents, 23 Juniors were of the opinion that ideally "pleasing our parents" should be a very strong (*A*) interest. Seventeen recorded it as true of themselves but only 9 thought it was true of the typical junior. Any other set of ratings may be similarly read.

order of interest taken introspectively and objectively still persists. As the introspective order is again nearer the ideal, the data further substantiate the fact of serious tendency of over-rating one's self.

The tendency to place one's self nearer the ideal than the typical, which is shown by the fact that the pooled ratings taken introspectively are nearer the ideal than when taken objectively, is again illustrated by the following data:

Sixty other juniors were asked to rate themselves on the blank presented here, entitled "Self-analysis Test."

SELF-ANALYSIS TEST

Name.....
Age.....
Years Months
School..... Grade.....
City..... Date.....
.....

DIRECTIONS: Read each question, then place an X in the column at the head of which is the answer that you think is true

Can you be trusted?	Answers			
	Always	Nearly always	Sometimes	Never
1. To do a given task exactly as it was given to you to do?.....				
2. To work faithfully when you work alone as when you are observed?...				
3. To stick to a point when you know you are right?.....				
4. To avoid taking property belonging to others?.....				
5. To avoid making false claims about yourself?.....				
6. To be fair in an examination?.....				
7. To return borrowed property?.....				
8. To keep a promise?.....				
9. To repeat a message accurately?.....				
10. To be honest in scoring yourself?.....				

They then rated the typical junior on a similar blank. The pooled results deal with the same data; the difference is in the manner of judging, subjective versus objective.

The first number in each pair of the summary sheets is the result of the objective ratings of the same group. The second number of each pair is the result of the introspective ratings.

SUMMARY OF JUDGMENTS ON SELF-ANALYSIS TEST

Can you be trusted?	Answers							
	Always		Nearly always		Sometimes		Never	
	Others–Self		Others–Self		Others–Self		Others–Self	
1. To do a given task exactly as it was given to you to do?	1	4	34	50	27	7	0	0
2. To work faithfully when you work alone as when you are observed?	2	23	25	25	34	11	1	0
3. To stick to a point when you know you are right?	15	38	38	19	9	4	0	0
4. To avoid taking property belonging to others?	10	48	35	9	17	3	0	0
5. To avoid making false claims about yourself?	3	38	25	21	33	2	1	1
6. To be fair in an examination?	4	33	36	27	22	1	0	0
7. To return borrowed property?	6	36	24	24	28	1	3	0
8. To keep a promise?	1	24	29	30	32	6	0	0
9. To repeat a message accurately?	3	18	30	24	27	7	2	1
10. To be honest in scoring yourself?	8	39	40	19	13	2	1	1
	53	301			242	44		

Looking at the column headed "Always," which denotes superiority when rating is objective, the total is 53; when introspective, 301. Looking at the column headed "Sometimes," which denotes relative inferiority when the rating is objective, the total is 242—when introspective, only 44.

These data are certainly an illustration of a naive over-rating of one's self, of "putting the best foot forward" proclivity, or of underestimating one's fellows. As students were specifically told not to

sign their names no conscious desire to cheat anyone else except themselves could have operated greatly.

One other set of data is illuminating in this connection. Using Mendenhall's Moral Character Scale, we get an average correlation of +52 between the relative importance of the traits—in the opinion of the reporter, and the amounts of each trait he thinks he possesses.

In our reporters, a group of graduate students, under-classmen, and professors, there was a clear tendency to speak well of themselves in those virtues considered of greater importance by them, and to rate themselves less highly in traits considered less vital. This positive correlation between the relative importance of traits and the amount of each trait a subject rates himself as possessing, may well be considered a self-defense mechanism whereby a person tends to think well of himself in what he judges important and evens up by under-rating himself in less significant items. Common sense shows that all of us would be readier to admit poor memory or poor handwriting than poor judgment or inferior trustworthiness.[1] This tendency should be figured on when interpreting the self-ratings of an observer. Whether this tendency applies also to the rating of others whom the rater likes, and whether a reverse tendency is present in the judging of those the rater dislikes is unknown.

We had another group of 50 college students rate the qualities used in this test, according to importance, from *A* to *F*. There was some disagreement as to the importance of the qualities which we can neglect here. Each then rated himself from 0 to 20 in each quality.

It is significant to find that these 50 reporters gave themselves an average of

14.75 points on *A* qualities
13.5 points on *B* qualities
11.1 points on *E* qualities
7.0 points on *F* qualities

The tendency to give higher rating to *A* and *B* qualities than are given to *E* and *F* qualities, falls in line with the distribution of correlation between rank order of qualities and amount possessed in each quality.

[1] This accounting of the +52 correlation is preferable to a more labored explanation which would contradict normal frequency areas of all of these traits as they actually are in our subjects—assuming then, distributions skewed positively for unimportant traits and skewed negatively for important traits.

These data amply support us in holding that there is a well-marked tendency for a person to overrate himself when he compares himself with others, and even when the introspective judgment is independent of comparison with others, this tendency still persists.

II. The Overlapping of Traits

Another pitfall is involved in analyzed rating schemes. These devices are used to get the rating for the several qualities or traits composing the whole. We find the inter-correlations of ratings for specific traits so high that the general opinion must be present in the ratings given to discrete traits.

Thorndike speaks of this as the spread. When ratings are obtained for traits X, Y and Z of a group the correlations between these ratings show more mutual relationship than could actually exist. These high correlations seem to show a tendency to keep rating the same thing over and over again under different headings. Thus when one gets a correlation of +94 between "quality of voice" and "moral stamina" in a teaching staff,[1] this agreement is taken to mean that the rater is giving his general estimation of teachers when he thinks he rates for voice and again when he thinks he rates for morals. The amount of spread or fusion of common factors found through inter-correlation studies of analyzed ratings of engineers (reported by Thorndike) and of teachers (reported by Knight) is so great that a pretty good case against the usefulness of analyzed ratings can be constructed.

The amount of this spread is a function of the method of rating as well as the inability of judges to rate for specific traits, and therefore it can be partially eliminated. The worst thing about analyzed ratings is not the too high correlations between traits, but the extreme variation of the size of the inter-correlation under different circumstances. This makes it impossible to diagnose the general factor, and to partial it out. To illustrate:

Using the Boice Teachers Rating Card, the inter-correlation on the 40 traits in a teaching staff of over 100 teachers, had a central tendency of +0.5 with variations about like a normal curve. Using a rating card calling for ratings in 10 traits commonly estimated as important for teachers and using the rank order method of rating in a Massachusetts school system (100 teachers), the correlations were all

[1] Knight, F. B.: Qualities Connected with Success in Teaching, *Teachers College Contributions*, in preparation.

too high, many being 0.9. Here every teacher rated every other teacher in the system. In another connection we had exceedingly competent judges rate 100 instructors in a middle-western university for "*savoir faire*," "research ability," and "ability to teach." The average of these inter-correlations was but +0.32.

Using three different methods for obtaining the same fact, we obtain central tendencies of inter-correlations of 0.3 to 0.9, which means that inter-correlations of traits is a highly variable function of the method of obtaining them.

We conclude here that in analyzed ratings there is a spread of aura present, but in no constant amount. Just how much added information analyzed ratings give over unanalyzed ratings is very uncertain. In using analyzed rating, then, the experimenter must determine the amount of spread indicated by unreasonably high inter-correlations and be careful to interpret his findings in the light of such spread.

INTELLIGENCE TESTS OF FOREIGN CHILDREN

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In Youngstown, Ohio, the children of the kindergarten, and of the first and second grades of three schools, were classified according to mental age in 1919 and 1920. The test used was a revision of the Binet Test which was prepared and given by members of the Children's Service Bureau of that city, and which showed a correlation of 97 with the Stanford Revision of the Binet Test. It required much less time to give this test than it did the Stanford Revision, and this saving in time was the reason for its use.

A large percentage of the children were of foreign parentage and heard only a foreign language in their homes. It was to discover the influence of this language handicap upon the Binet Test that the following investigation was made.

The nationalities of the children were obtained from cards which the teachers had sent home with the children at the beginning of the school year, requesting such information as the child's name, address, age, birth date, father's name, and nationality.

The child's chronological age was then verified by the teacher from birth certificate, or church records where possible. The records of only those children whose ages were thus verified were used in the preparation of this article.

The records of Jewish children were eliminated from the totals unless the cards definitely stated whether they were of American or foreign parentage. The English speaking group includes American white, Negro, English, Canadian, Scotch, Irish, and Welsh. The foreign group is predominately Italian and Slavish, but includes also the following nationalities: German, Greek, Hungarian, Polish, Finnish, Croatian, Austrian, French, Swedish, Syrian, Gypsy, Lithuanian, Roumanian, Spanish, Russian, and Indian. No attempt was made to distinguish between race and nationality, but they were noted just as they were written on the cards.

Although the number of cases was not sufficient to make the results very significant, the average Intelligence Quotient for each nationality is listed below for whatever interest it might contain.

The average for all the 79 Jewish children irrespective of whether they spoke English or a foreign language was 95.

English speaking			Foreign speaking		
Number of cases	Nationality	IQ	Number of cases	Nationality	IQ
249	American (white).....	95	313	Italian.....	84
71	American (colored)...	88	130	Slavish.....	85
24	English.....	97	99	Hungarian.....	89
3	Canadian.....	89	37	German.....	91
8	Scotch.....	88	18	Roumanian.....	97
5	Irish.....	92	12	Greek.....	83
7	Welsh.....	93	11	Polish.....	85
			10	Russian.....	89
			7	Lithuanian.....	87
			5	Croatian.....	86
			4	Syrian.....	80
			4	Gypsy.....	74
			4	Finnish.....	94
			3	Austrian.....	94
			3	Swedish.....	104
			2	Spanish.....	93
			1	Indian.....	93
			1	French.....	125

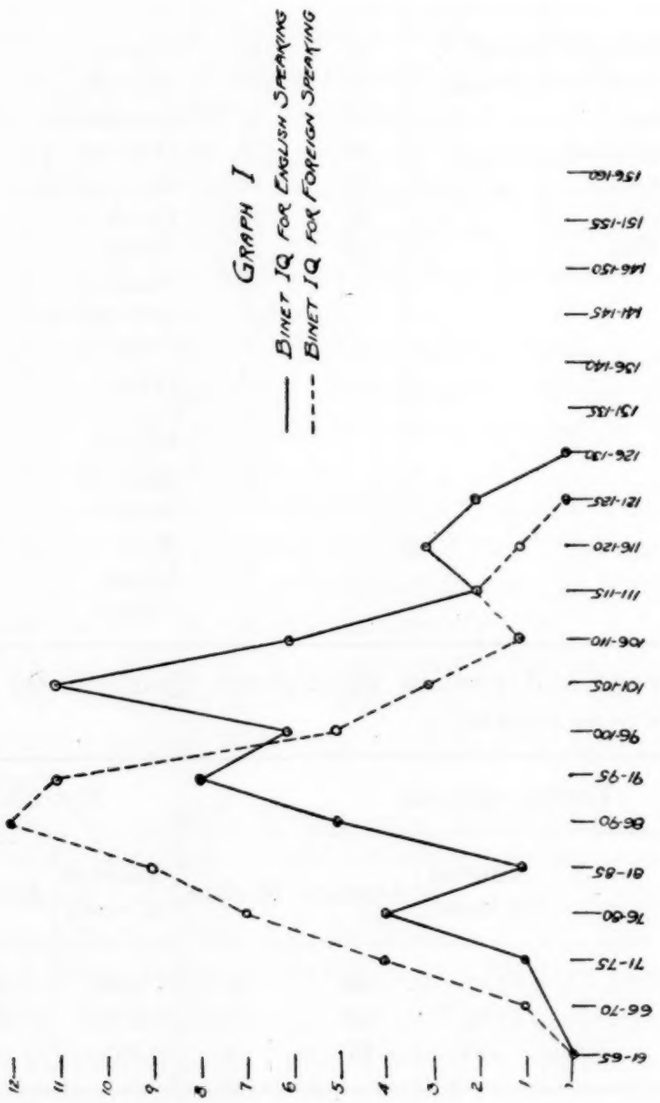
The average and median Intelligence Quotient for each of the three schools is as follows:

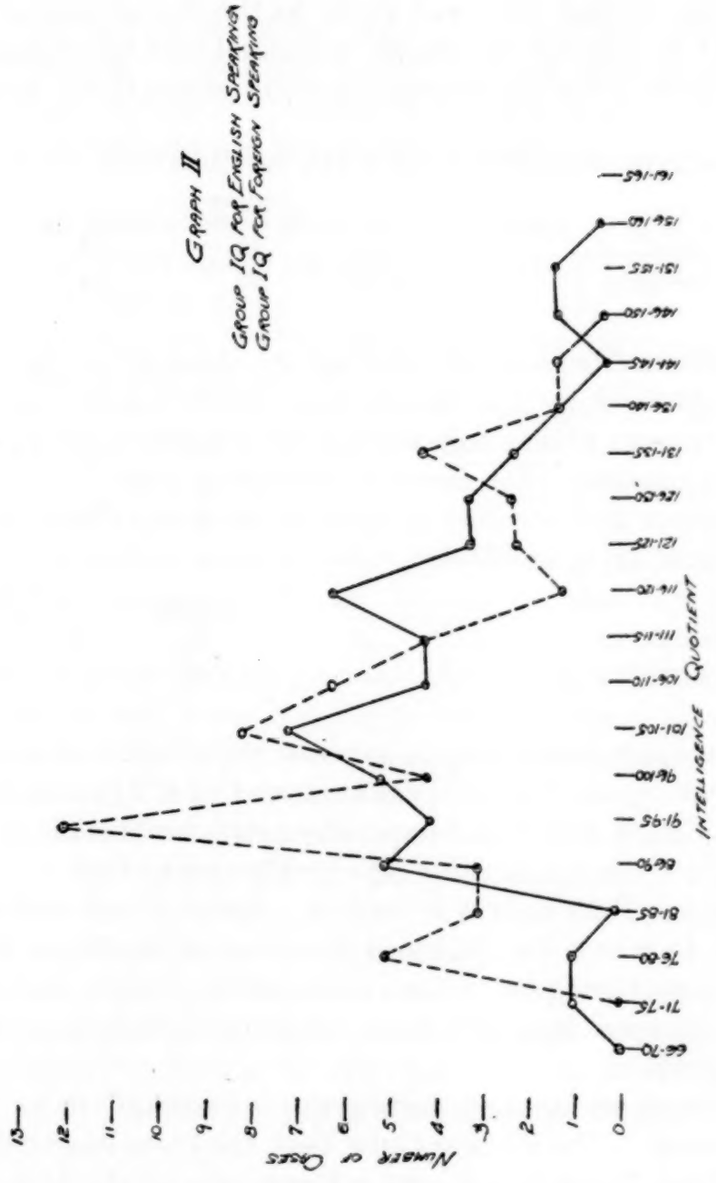
	English speaking			Foreign speaking		
	Number of cases	Average	Median	Number of cases	Average	Median
School I.....	145	96	97	230	86	86
School II.....	172	90	93	261	83	83
School III.....	50	91	91	183	87	86

From the above table, it will be seen that both the average and the median for the English speaking children of all three schools are significantly higher than those of the foreign speaking children.

The average and median Intelligence Quotients for all the English and all the foreign speaking children in the three schools are:

	Number of Cases	Average	Median
English.....	367	92	94
Foreign.....	674	84	85


GRAPH I
BINET IQ FOR ENGLISH SPEAKING
BINET IQ FOR FOREIGN SPEAKING
156-160
151-155
146-150
141-145
136-140
131-135
126-130
121-125
116-120
111-115
106-110
101-105
96-100
91-95
86-90
81-85
76-80
71-75
66-70
61-65
12
11
10
9
8
7
6
5
4
3
2
1


GRAPH II
GROUP IQ FOR ENGLISH SPEAKING
GROUP IQ FOR FOREIGN SPEAKING
INTELLIGENCE QUOTIENT
NUMBER OF CASES

It is obvious, therefore, that the foreign child rates decidedly lower on the Binet Scale, whether because of actual lower intelligence, or because of a language handicap.

The Pintner Non-language Test and the Binet Test.—The Pintner Non-language Group Test was given to the second grades in School No. I, and following are the results compared with the results obtained by the Children's Service Bureau Revision of the Binet Test.

AVERAGE INTELLIGENCE QUOTIENTS FOR THE BINET AND GROUP TESTS

	NUMBER OF CASES	BINET IQ	GROUP IQ
English speaking	49	99	109
Foreign speaking	56	89	103

The difference between the average IQ obtained by the Binet Test and that obtained by the Group Test which requires the use of a minimum amount of language was for the English speaking 10 and for the Foreign speaking 14 in favor of the Group Test.

The number and per cent of cases in which the Group IQ is higher than the Binet IQ is as follows:

	NUMBER	PER CENT OF TOTAL
English speaking	36	73
Foreign speaking	46	82

In the accompanying graphs are seen the number of cases of both English speaking and foreign speaking found with IQ's within a certain range. In Graph I are the comparative IQ's for the Binet Test, and in Graph II are the comparative IQ's for the Group Test.

Performance Tests and the Binet Test.—From the office files all cases were taken to whom the Stanford Revision of the Binet Test and a series of at least three performance tests had been given, and the results of the English speaking group were compared with those of the foreign speaking group.

The series of performance tests given included all, or at least three of the following: The Pintner Cube Test, the Form Board, the Witmer Cylinders Test, Healy Construction Puzzle A, and the Mare and Foal Test. The subjects ranged in age from very young children to adults. They were court cases, Children's Home cases, medical cases, in fact, all the usual types of cases found in a psychological clinic with a large percentage of foreign cases.

The necessary data concerning nationality, age, and birth date,

were obtained from parents if they were present, from court records where possible, or from some responsible person who accompanied the child, or from the child himself if his age and degree of intelligence seemed to warrant that he was a reliable source of information.

The median mental age of the series of performance tests was used for the comparison. The Binet mental age was correlated with the performance age of both the English speaking and the foreign speaking, and the correlations are as follows: English speaking, 64; foreign speaking 48.

The average amounts of difference between the mental age and the performance age expressed in months are: for the English speaking 6; for the foreign speaking 16.

The number and per cent of cases where the performance age is higher than the mental age are:

	Number of Cases	Per Cent of Total
English speaking	45	52
Foreign speaking	95	75

The accompanying table compares the average mental age with the average performance age for groups of each six months of chronological age.

With the English speaking group, the average performance age is higher in ten groups, lower in seven groups, and equal in two groups. With the foreign speaking, the average preformance age is higher in twenty groups and lower in two groups.

Summary and Conclusions.—A revision of the Binet Test given to children in three schools in which a large majority were foreign speaking, gave the following results: Average IQ for the English speaking 92; average IQ for the foreign speaking 84.

The Pintner Group Test given to one group of these children showed a much higher IQ both for the English speaking and the foreign speaking, but for the foreign speaking, the difference between the results of the two tests was greater and in favor of the foreign group.

In comparing the results obtained from a group of cases given the Stanford Revision of the Binet Test, and a series of Performance Tests, we find the correlation between the tests considerably better for the English speaking group than for the foreign speaking, and there were twenty-three per cent more cases of foreign speaking children than of English speaking where the performance age was higher than the mental age.

English speaking Chronological age.[1]	5–1 to 5–5	5–6 to 6–0	6–1 to 6–5	6–6 to 7–0	7–1 to 7–5	7–6 to 8–0	8–1 to 8–5	8–6 to 9–0	9–1 to 9–5	9–6 to 10–0	10–1 to 10–5	10–6 to 11–0	11–1 to 11–5	11–6 to 12–0	12–1 to 12–5	12–6 to 13–0	13–1 to 13–5	13–6 to 14–0	14–1 to 14–5	14–6 to 15–0	15–1 to 15–5	15–6 to 16–0	Adult
Average MA (months).....	56	....	....	....	92	86	100	94	93	113	116	106	121	146	113	122	136	125	134	119	121	....	134
Average PA (months).....	78	....	....	....	94	85	84	94	97	114	103	119	100	127	107	122	154	145	127	142	164	....	142
Number of cases...	2	0	0	0	2	3	2	9	4	5	4	5	2	5	6	6	3	3	6	9	2	0	9

Foreign Chronological age.	5–1 to 5–5	5–6 to 6–0	6–1 to 6–5	6–6 to 7–0	7–1 to 7–5	7–6 to 8–0	8–1 to 8–5	8–6 to 9–0	9–1 to 9–5	9–6 to 10–0	10–1 to 10–5	10–6 to 11–0	11–1 to 11–5	11–6 to 12–0	12–1 to 12–5	12–6 to 13–0	13–1 to 13–5	13–6 to 14–0	14–1 to 14–5	14–6 to 15–0	15–1 to 15–5	15–6 to 16–0	Adult 7
Average MA (months).....	....	52	52	54	57	64	67	71	82	71	92	93	102	103	100	101	102	106	99	104	105	109	110
Average PA (months).....	....	80	72	82	84	82	78	83	91	95	120	104	100	108	113	130	124	117	98	118	134	136	129
Number of cases...	0	1	2	5	2	3	3	3	8	7	3	8	9	11	10	10	10	7	6	5	1	6	7

From these results, we may conclude that children who hear a foreign language at home, test lower as a rule when given the revisions of the Binet Test than when given tests which require a minimum knowledge of English. And that when classified according to mental age, those children who hear a foreign language in their homes may suffer a serious handicap when tested only by the revisions of the Binet Test.

THE CORRELATIONS OF ACHIEVEMENT IN SCHOOL SUBJECTS WITH INTELLIGENCE TESTS AND OTHER VARIABLES (CONTINUED)

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PART III. RESULTS FOR GRADES IV TO VIII

1. *The Relation between Verbalness and the Magnitude of Correlations with the Criterion.*—Most of the tests used in grades IV and up are verbal or mixed. In order to get a range of material from the most non-verbal to the most verbal, the various exercises in the tests were arranged, according to the judgments of a group of workers familiar with test construction, in a scale with units from zero, extremely non-verbal, to 7.0 extremely verbal.[1] The list is too long to print. At the non-verbal extreme are such tests as Dearborn II, Nos. 7, 3, 9, Myers 3, 4, Haggerty A2, No. 3, etc. and at the other extreme, N. I. T. –B, No. 3; N. I. T.–A, No 2; Otis Advanced No. 9; Dearborn II, No. 4.

The scale was divided into four sections each of which included sufficient tests to represent about one hour of working time. The scores for the exercises in each section were summated and the coëfficients with the criteria obtained from the records for grades IV, V and VI as one group and for grades VII and VIII as another. The correlations have, of course, no validity except for comparisons within the same group.

The results appear in Tables III and IV. The verbal materials yield a higher correlation with mental age than the non-verbal, although the difference between the third and fourth steps is very small. Competent judges place the Stanford test in group 3. Its correlation is slightly higher, however, with group 4 which is more verbal.

In both groups of subjects, the second step on the verbal scale gives the highest correlation with arithmetic. Most arithmetical problems are judged to be of about that degree of verbalness.

If the tests become more verbal than arithmetic in general is judged to be, the correlation drops, although the drop may really

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[1] This scale which was originally constructed by Dr. John Herring is described in detail in a thesis, as yet unpublished, in the library at Teachers College. Dr. Herring's scale was used as a framework to which additional exercises in our tests were affixed.

be due to the greater identity of content than to degree of verbalness in general.

For both groups, the higher the material on the verbal scale, the higher the correlation with spelling. The same is true of reading, which shows the greatest increase in correlation as the material becomes more verbal. Competent judges place both of these subjects high on the verbal scale.

The composite of achievement, which is weighted heavily by the verbal subjects, shows an increasing correlation as the tests became more verbal. The correlations with the composite are higher than those with single subjects partly because the composite is a more reliable measure and doubtless partly because each of the component subjects has an independent partial correlation with the intelligence tests.

These results for the upper grades agree in all essentials with the findings for grade III.

TABLE III.—CORRELATIONS FOR A GROUP COMPOSED OF PUPILS OF GRADES IV, V AND VI. n = 63

	1 Mental age	2 Arithmetic	3 Spelling	4 Reading	5 Composite achievement
1. Most non-verbal	0.40	0.39	0.18	0.32	0.46
2. Somewhat verbal	0.49	0.68	0.38	0.39	0.62
3. More verbal	0.68	0.59	0.46	0.65	0.75
4. Most verbal	0.73	0.49	0.49	0.76	0.79

TABLE IV.—CORRELATIONS FOR A GROUP COMPOSED OF PUPILS OF GRADES VII AND VIII. n = 42

	1 Arithmetic	2 Spelling	3 Reading	4 Composite achievement
1. Most non-verbal	0.17	0.09	0.03	0.10
2. Somewhat verbal	0.49	0.29	0.49	0.56
3. More verbal	0.29	0.38	0.53	0.55
4. Most verbal	0.24	0.44	0.67	0.60

2. *The Relation between the Magnitude of the Correlations and the Length of the Test.*—In Parts I and II, high positive correlations were found between the length of the test and the magnitude of the correlations with the criterion. In the case of grades IV to VIII, it is less easy to make this comparison for the reason that the tests also differ in the degree of verbal material which they contain.

TABLE V.—SHOWING THE LENGTH IN MINUTES, THE DEGREE OF VERBALNESS ON A SCALE IN WHICH 1.0 IS VERY NON-VERBAL, AND 4.0 VERY VERBAL AND THE AVERAGE *r* WITH ACHIEVEMENT FOR VARIOUS TESTS

	1 Time (minutes)	2 Verbalness	3 Mean *r* with achievement
Dearborn Total	80	1.8	0.47
Otis advanced	47	3.0	0.63
Dearborn 5	45	1.8	0.43
Dearborn 4	35	1.8	0.38
National Total	33	2.6	0.63
Thorndike-McCall	30	3.6	0.48
Terman Groups	27	3.2	0.55
Haggerty, Delta 2	21	2.3	0.52
National A	17	2.6	0.56
Illinois	17	2.6	0.48
National B	16	2.6	0.66
Myers	15	1.0	0.12
Holley	12	3.0	0.43

Following are the simple correlations of the columns:

1. Achievement with verbalness 0.67
2. Achievement with time ..... –0.04
3. Time with verbalness ..... –0.28

Since the length of tests and verbalness are negatively correlated, the simple coëfficients do not display clearly the influence of either.

By use of the regression equation, the proper independent weight of time and verbalness in determining the correlation with achievement are:

4. Weight of verbalness 1.00
5. Weight of time (β) 0.224

The independent correlations of time and verbalness can best be

shown by partial correlation of each with the criterion when the other is held constant. The partial correlations, first order, are:

6. Partial r, criterion with verbalness (time constant).... 0.69
7. Partial r, criterion with time (verbalness constant).... 0.21

Both time and the degree of verbalness are determining factors, but verbalness alone yields a higher correlation ,with achievement than time alone. That is to say for purposes of predicting school achievement it is better to have a very verbal test than a very long test, if one cannot have both. The best thing to have is a long verbal test, as the following multiple correlation shows.

8. Multiple r, achievement with (verbal + time)..... 0.73

This figure should be compared with 6 and 7 above.

3. *The Validity of the Decidedly Non-verbal Tests; Grade Differences.* Table VI gives the correlations for each test for grades IV–VIII separately with the means of the grade columns. Column 14 gives the mean correlation of each test with other group tests. In computing the mean inter-correlations, the correlations of parts of the Dearborn and National Tests with the total, and the total with the parts have been omitted.

The Myers Test is wholly non-verbal, the Dearborn contains a great deal of non-verbal material, but the other tests are largely verbal.

Study of Table VI discloses the fact that the Myers tests shows small inter-correlations with the verbal tests. The mean inter-correlation with all other tests is 0.21 as compared to 0.47, the mean of the mean inter-correlation of all other tests. The correlations of the Myers with the various measures of achievement are very low compared to others. This is in line with the expectations set up by the foregoing sections. The non-verbal material doubtless provides a useful measure of some human traits, but in these grades at least, not with achievement in school subjects and other functions which are largely verbal.

It should be noted that the Myers test agrees with other criteria much more closely in grades IV, V and VI than in VII and VIII. The Myer's correlations with Mental Age also drops rapidly as the grade becomes higher.

The Myers test correlates more closely with the Dearborn Examinations than with others. This, we are quite certain, is due to the fact that the latter test is more non-verbal than any others. The Dearborn contains considerable verbal material and agrees more closely with other group tests than does the Myers. The mean correlation of

TABLE VI.—CORRELATIONS GRADES IV–VIII

Grade	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Myers	Dearborn 4	Dearborn 5	Dearborn 4 and 5	National Intelligence Test A	National Intelligence Test B	National Intelligence Test A and B	Holley Vocabulary	Otis Advanced	Haggerty Delta 2	Illinois	Terman Group	Thorndike-McCall	Mean Intercorrelation	Stanford Mental Age	Reading Comprehension	Reading Rate	Arithmetic	Spelling	Composite Achievement
Correlations of Myers Mental Measure with																				
IV	.....	0.45	0.71	0.56	0.25	0.23	0.46	0.15	.....	0.20	0.29	....	0.08	0.29	0.41	0.17	0.10	0.27	0.09	0.22
V	.....	0.76	0.47	0.55	0.30	0.25	0.52	0.21	0.40	0.16	0.23	....	0.26	0.29	0.29	0.15	0.12	0.16	0.18	0.17
VI	.....	0.42	0.51	0.54	0.44	0.28	0.40	0.30	0.50	0.40	0.46	....	0.18	0.34	0.15	0.26	0.30	0.21	0.21	0.29
VII	.....	0.52	0.35	0.40	−0.10	0.00	−0.05	0.30	0.29	0.19	−0.24	0.15	0.13	0.14	....	0.22	−0.03	0.08	0.08	0.08
VIII	.....	0.46	0.39	0.52	−0.30	−0.38	−0.40	−0.18	−0.37	−0.06	−0.11	0.07	−0.30	−0.03	....	−0.26	−0.38	0.00	−0.03	−0.15
Mean.....	.....	0.52	0.49	0.51	0.12	0.08	0.15	0.16	0.21	0.16	0.13	0.11	0.07	0.21	0.28	0.11	0.02	0.14	0.11	0.12
SD.....	.....	0.12	0.13	0.06	0.27	0.25	0.33	0.18	0.34	0.15	0.29	0.04	0.19	0.14	0.11	0.16	0.23	0.10	0.08	0.15
Correlations, Dearborn Examination 4 with																				
IV	0.45	.....	0.93	0.95	0.44	0.33	0.52	0.39	.....	0.56	0.48	....	0.33	0.43	0.28	0.37	0.14	0.37	0.39	0.44
V	0.76	.....	0.73	0.90	0.50	0.34	0.45	0.47	0.56	0.42	0.50	....	0.53	0.48	0.59	0.42	0.28	0.36	0.14	0.45
VI	0.42	.....	0.78	0.89	0.64	0.47	0.59	0.55	0.66	0.70	0.59	....	0.65	0.58	0.68	0.65	0.59	0.35	0.30	0.60
VII	0.52	.....	0.61	0.88	0.27	0.27	0.38	0.34	0.53	0.48	0.32	0.46	0.59	0.41	....	0.52	0.55	0.22	0.21	0.30
VIII	0.46	.....	0.53	0.77	0.08	−0.06	0.06	0.00	0.12	0.27	0.05	0.43	0.06	0.15	....	0.12	−0.05	0.15	0.04	0.09
Mean.....	0.52	.....	0.72	0.88	0.39	0.27	0.40	0.35	0.47	0.49	0.39	0.45	0.43	0.41	0.52	0.42	0.30	0.29	0.22	0.38
SD.....	0.12	.....	0.14	0.06	0.19	0.17	0.18	0.19	0.21	0.14	0.19	0.02	0.21	0.14	0.17	0.18	0.24	0.09	0.12	0.17

TABLE VI.—(*Continued*)

Grade	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Myers	Dearborn 4	Dearborn	Dearborn 4 and 5	National Intelligence Test A	National Intelligence Test B	National Intelligence Test A and B	Holley Vocabulary	Otis Advanced	Haggerty Delta 2	Illinois	Terman Group	Thorndike-McCall	Mean Intercorrelation	Stanford Mental Age	Reading Comprehension	Reading Rate	Arithmetic	Spelling	Composite Achievement
Correlations, Dearborn Examination 5 with																				
IV	0.71	0.93	....	0.97	0.45	0.41	0.73	0.26	.....	0.72	0.69	....	0.46	0.57	0.48	0.49	0.34	0.49	0.57	0.64
V	0.47	0.73	....	0.98	0.52	0.41	0.76	0.40	0.62	0.45	0.60	....	0.63	0.48	0.44	0.51	0.26	0.28	0.19	0.47
VI	0.51	0.78	....	0.88	0.55	0.45	0.57	0.46	0.70	0.55	0.52	....	0.52	0.51	0.56	0.66	0.45	0.28	0.15	0.49
VII	0.35	0.61	....	0.86	0.21	0.43	0.40	0.29	0.37	0.32	0.17	0.59	0.34	0.34	....	0.32	0.29	0.18	0.13	0.39
VIII	0.39	0.53	....	0.69	0.22	0.12	0.30	0.00	0.22	0.36	0.40	0.50	0.06	0.24	....	0.28	0.14	0.21	0.02	0.18
Mean.....	0.49	0.72	....	0.88	0.39	0.36	0.55	0.28	0.48	0.48	0.48	0.55	0.40	0.43	0.49	0.45	0.30	0.31	0.21	0.43
SD.....	0.13	0.14	....	0.10	0.15	0.12	0.18	0.19	0.19	0.14	0.18	0.05	0.21	0.12	0.05	0.14	0.10	0.15	0.19	0.15
Correlations, Dearborn Total with																				
IV	0.56	0.95	0.97	....	0.42	0.41	0.54	0.36	.....	0.68	0.59	....	0.51	0.51	0.50	0.49	0.39	0.60	0.44	0.61
V	0.55	0.90	0.98	....	0.59	0.51	0.62	0.47	0.66	0.48	0.58	....	0.65	0.51	0.55	0.58	0.33	0.42	0.18	0.55
VI	0.54	0.89	0.88	....	0.56	0.54	0.57	0.55	0.74	0.65	0.60	....	0.68	0.57	0.68	0.70	0.46	0.33	0.27	0.53
VII	0.40	0.88	0.86	....	0.31	0.39	0.44	0.36	0.48	0.46	0.28	0.57	0.48	0.40	....	0.53	0.44	0.29	0.19	0.44
VIII	0.52	0.77	0.69	....	0.16	0.09	0.21	0.00	0.24	0.36	0.21	0.44	0.12	0.22	....	0.31	0.12	0.21	0.09	0.20
Mean.....	0.51	0.88	0.88	....	0.41	0.39	0.48	0.35	0.53	0.53	0.45	0.51	0.49	0.44	0.58	0.52	0.35	0.37	0.23	0.47
SD.....	0.06	0.06	0.10	....	0.15	0.15	0.15	0.20	0.17	0.12	0.17	0.07	0.20	0.12	0.09	0.13	0.12	0.10	0.12	0.14

Correlations of National, Form A with

IV	0.25	0.44	0.45	0.42	.....	0.66	0.79	0.36	.....	0.59	0.59	....	0.51	0.48	0.38	0.63	0.49	0.35	0.52	0.54
V	0.30	0.50	0.52	0.59	.....	0.61	0.87	0.53	0.61	0.49	0.76	....	0.80	0.53	0.50	0.70	0.54	0.21	0.35	0.48
VI	0.44	0.64	0.55	0.56	.....	0.68	0.90	0.47	0.71	0.55	0.74	....	0.46	0.54	0.53	0.55	0.56	0.20	0.39	0.59
VII	−0.10	0.27	0.21	0.31	.....	0.74	0.92	0.26	0.55	0.63	0.79	0.48	0.37	0.43	....	0.57	0.61	0.26	0.29	0.58
VIII	−0.30	0.08	0.22	0.16	.....	0.86	0.97	0.16	0.58	0.50	0.73	0.44	0.37	0.40	....	0.50	0.75	0.29	0.40	0.63
Mean.....	0.12	0.39	0.39	0.41	.....	0.70	0.89	0.36	0.61	0.55	0.72	0.46	0.51	0.48	0.47	0.59	0.59	0.26	0.39	0.56
SD.....	0.27	0.19	0.15	0.15	.....	0.08	0.06	0.13	0.06	0.05	0.07	0.02	0.16	0.05	0.06	0.07	0.09	0.05	0.08	0.05

Correlations of National, Form B with

IV	0.23	0.33	0.41	0.41	0.66	.....	0.77	0.41	.....	0.58	0.62	....	0.56	0.47	0.40	0.57	0.40	0.25	0.60	0.67
V	0.25	0.34	0.41	0.51	0.61	.....	0.85	0.31	0.66	0.53	0.47	....	0.41	0.47	0.45	0.66	0.45	0.27	0.58	0.54
VI	0.28	0.47	0.45	0.54	0.68	.....	0.89	0.50	0.67	0.46	0.68	....	0.61	0.54	0.50	0.51	0.57	0.47	0.43	0.70
VII	0.00	0.27	0.43	0.39	0.74	.....	0.90	0.17	0.55	0.51	0.77	0.51	0.34	0.46	....	0.59	0.60	0.45	0.41	0.68
VIII	−0.38	−0.06	0.12	0.09	0.86	.....	0.96	0.20	0.56	0.61	0.62	0.47	0.39	0.39	....	0.48	0.69	0.36	0.49	0.69
Mean.....	0.08	0.27	0.36	0.39	0.70	.....	0.87	0.32	0.61	0.54	0.63	0.49	0.46	0.47	0.45	0.56	0.54	0.36	0.50	0.66
SD.....	0.25	0.17	0.12	0.15	0.08	.....	0.06	0.12	0.06	0.05	0.10	0.02	0.10	0.05	0.04	0.06	0.10	0.09	0.08	0.06

Correlations, National, Forms A and B (total) with

IV	0.46	0.52	0.73	0.54	0.79	0.77	.....	0.39	.....	0.63	0.64	....	0.56	0.53	0.46	0.64	0.45	0.32	0.55	0.65
V	0.32	0.45	0.76	0.62	0.87	0.85	.....	0.48	0.73	0.55	0.61	....	0.53	0.54	0.52	0.72	0.55	0.29	0.48	0.56
VI	0.40	0.59	0.57	0.57	0.90	0.89	.....	0.53	0.72	0.58	0.68	....	0.58	0.56	0.58	0.63	0.60	0.33	0.43	0.63
VII	−0.05	0.38	0.40	0.44	0.92	0.90	.....	0.27	0.58	0.66	0.80	0.56	0.42	0.48	....	0.64	0.65	0.36	0.36	0.66
VIII	−0.40	0.06	0.30	0.21	0.97	0.96	.....	0.22	0.60	0.60	0.66	0.50	0.44	0.40	....	0.58	0.68	0.31	0.46	0.66
Mean.....	0.15	0.40	0.55	0.48	0.89	0.87	.....	0.38	0.66	0.60	0.68	0.53	0.51	0.50	0.51	0.64	0.59	0.32	0.46	0.63
SD.....	0.33	0.18	0.18	0.15	0.06	0.06	.....	0.12	0.05	0.04	0.07	0.03	0.06	0.06	0.05	0.04	0.08	0.02	0.06	0.04

TABLE VI.—(*Contined*)

Grade	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Myers	Dearborn	Dearbon 5	Dearborn 4 and 5	National Intelligence Test A	National Intelligence Test B	National Intelligence Test A and B	Holley Vocabulary	Otis Advanced	Haggerty Delta 2	Illinois	Terman Group	Thornlike-McCall	Mean Intercorrelation	Stanford Mental Age	Reading Comprehension	Reading Rate	Arithmetic	Spelling	Composite Achievement
Correlations, Holley's Vocabulary with																				
IV	0.15	0.39	0.26	0.36	0.36	0.41	0.39	.....	.....	0.39	0.38	....	0.61	0.40	0.38	0.73	0.73	0.04	0.44	0.42
V	0.21	0.47	0.40	0.47	0.53	0.31	0.48	.....	0.43	0.42	0.33	....	0.49	0.40	0.38	0.56	9.41	0.20	0.20	0.44
VI	0.30	0.55	0.46	0.55	0.47	0.50	0.53	.....	0.70	0.44	0.46	....	0.58	0.49	0.51	0.65	0.63	0.08	0.45	0.49
VII	0.30	0.34	0.29	0.36	0.26	0.17	0.27	.....	0.54	0.38	0.29	0.52	0.43	0.36	....	0.50	0.57	0.12	0.39	0.43
VIII	−0.18	0.00	0.00	0.00	0.16	0.20	0.22	.....	0.33	0.12	0.24	0.28	0.54	0.22	....	0.48	0.31	0.24	0.40	0.39
Mean.....	0.16	0.35	0.28	0.35	0.36	0.32	0.38	.....	0.50	0.35	0.34	0.40	0.54	0.37	0.42	0.60	0.55	0.14	0.38	0.43
SD.....	0.18	0.19	0.19	0.20	0.13	0.12	0.12	.....	0.14	0.12	0.08	0.12	0.06	0.09	0.06	0.10	0.15	0.07	0.09	0.03
Correlations, Otis Advanced with																				
V	0.40	0.56	0.62	0.66	0.61	0.66	0.73	0.43	.....	0.44	0.60	....	0.75	0.53	0.55	0.73	0.49	0.10	0.23	0.50
VI	0.50	0.66	0.70	0.74	0.71	0.67	0.72	0.70	.....	0.74	0.59	....	0.72	0.64	0.66	0.61	0.64	0.40	0.41	0.65
VII	0.29	0.53	0.37	0.48	0.55	0.55	0.58	0.54	.....	0.58	0.57	0.70	0.51	0.53	....	0.77	0.70	0.26	0.40	0.66
VIII	−0.37	0.12	0.22	0.24	0.58	0.56	0.60	0.33	.....	0.78	0.41	0.71	0.47	0.43	....	0.60	0.56	0.38	0.50	0.69
Mean.....	0.21	0.47	0.48	0.53	0.61	0.61	0.66	0.50	.....	0.64	0.54	0.71	0.61	0.53	0.61	0.68	0.60	0.29	0.39	0.63
SD.....	0.34	0.21	0.19	0.17	0.06	0.06	0.06	0.14	.....	0.14	0.08	0.01	0.12	0.07	0.06	0.07	0.08	0.12	0.10	0.07

Correlations, Haggerty Delta 2 with

IV	0.20	0.56	0.72	0.68	0.59	0.58	0.63	0.39	.....	.....	0.47	....	0.72	0.49	0.24	0.62	0.36	0.12	0.49	0.46
V	0.16	0.42	0.45	0.48	0.49	0.53	0.55	0.42	0.44	.....	0.57	....	0.46	0.45	0.57	0.66	0.67	0.09	0.26	0.49
VI	0.40	0.70	0.55	0.65	0.55	0.46	0.58	0.44	0.74	.....	0.44	....	0.62	0.53	0.64	0.60	0.49	0.35	0.30	0.55
VII	0.19	0.48	0.32	0.46	0.63	0.51	0.66	0.38	0.58	.....	0.54	0.68	0.48	0.51	....	0.69	0.64	0.30	0.43	0.61
VIII	−0.06	0.27	0.36	0.36	0.50	0.61	0.60	0.12	0.78	.....	0.52	0.71	0.51	0.43	....	0.59	0.36	0.27	0.41	0.48
Mean.....	0.16	0.49	0.48	0.53	0.55	0.54	0.60	0.35	0.64	.....	0.51	0.70	0.56	0.48	0.48	0.63	0.50	0.23	0.38	0.52
SD.....	0.15	0.14	0.14	0.12	0.05	0.05	0.04	0.12	0.14	.....	0.05	0.02	0.10	0.04	0.17	0.04	0.13	0.10	0.09	0.06

Correlations, Illinois with

IV	0.29	0.48	0.69	0.59	0.59	0.62	0.64	0.38	.....	0.47	.....	....	0.34	0.48	0.28	0.59	0.55	0.22	0.46	0.45
V	0.23	0.50	0.60	0.58	0.76	0.47	0.61	0.33	0.60	0.57	.....	....	0.66	0.50	0.50	0.65	0.52	0.17	0.26	0.46
VI	0.46	0.59	0.52	0.60	0.74	0.68	0.68	0.46	0.59	0.44	.....	....	0.58	0.54	0.56	0.55	0.42	0.41	0.40	0.50
VII	−0.24	0.32	0.17	0.28	0.79	0.77	0.86	0.29	0.57	0.54	.....	0.63	0.59	0.47	....	0.67	0.70	0.28	0.32	0.52
VIII	−0.11	0.05	0.40	0.21	0.73	0.62	0.66	0.24	0.41	0.52	.....	0.43	0.49	0.40	....	0.60	0.45	0.19	0.35	0.49
Mean.....	0.13	0.39	0.48	0.45	0.72	0.63	0.68	0.34	0.54	0.51	.....	0.53	0.53	0.48	0.45	0.61	0.53	0.27	0.36	0.48
SD.....	0.29	0.19	0.18	0.17	0.07	0.10	0.07	0.08	0.08	0.05	.....	0.10	0.11	0.05	0.12	0.04	0.10	0.08	0.07	0.03

Correlations, Terman Group with

VIII	0.15	0.46	0.59	0.57	0.48	0.51	0.56	0.52	0.70	0.68	0.63	....	0.58	0.51	....	0.61	0.47	0.18	0.41	0.52
IX	0.07	0.43	0.50	0.44	0.44	0.47	0.50	0.28	0.71	0.71	0.43	....	0.54	0.47	....	0.66	0.55	0.23	0.39	0.58
Mean.....	0.11	0.45	0.55	0.51	0.46	0.49	0.53	0.40	0.71	0.70	0.53	....	0.56	0.49	....	0.64	0.51	0.21	0.40	0.55
SD.....	0.04	0.02	0.05	0.07	0.02	0.02	0.03	0.12	0.01	0.02	0.10	....	0.02	0.02	....	0.03	0.04	0.03	0.01	0.03

TABLE VI.—*Continued.*

Grade	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Myers	Dearborn 4	Dearborn 5	Dearborn 4 and 5	National Intelligence Test A	National Intelligence Test B	National Intelligence Test A and B	Holley Vocabulary	Otis Advanced	Haggerty Delta 2	Illinois	Terman Group	Thorndike-McCall	Mean Intercorrelation	Stanford Mental Age	Reading Comprehension	Reading Rate	Arithmetic	Spelling	Composite Achievement
Correlations, Thorndike-McCall with																				
IV	0.08	0.33	0.46	0.51	0.51	0.56	0.56	0.61	.....	0.72	0.34	....	.....	0.44	0.35	0.76	0.43	0.10	0.23	0.47
V	0.26	0.53	0.63	0.65	0.86	0.41	0.53	0.49	0.75	0.46	0.66	....	.....	0.52	0.62	0.76	0.45	0.02	0.29	0.46
VI	0.18	0.65	0.52	0.68	0.46	0.61	0.58	0.58	0.72	0.62	0.58	....	.....	0.54	0.75	0.64	0.42	0.31	0.32	0.49
VII	0.13	0.59	0.34	0.48	0.37	0.34	0.42	0.43	0.51	0.48	0.59	0.58	.....	0.43	....	0.52	0.50	0.12	0.39	0.47
VIII	−0.30	0.06	0.06	0.12	0.37	0.39	0.44	0.54	0.47	0.51	0.49	0.54	.....	0.35	....	0.81	0.50	0.09	0.40	0.50
Mean.....	0.07	0.43	0.40	0.49	0.51	0.46	0.51	0.54	0.61	0.56	0.53	0.56	.....	0.46	0.57	0.73	0.52	0.13	0.33	0.48
SD.....	0.19	0.21	0.21	0.20	0.16	0.10	0.06	0.06	0.12	0.10	0.11	0.02	.....	0.07	0.17	0.12	0.14	0.10	0.06	0.01
Correlations of Stanford Mental Age with																				
IV	0.41	0.28	0.48	0.50	0.38	0.40	0.46	0.38	.....	0.24	0.28	....	0.35	0.38	....	0.36	0.23	0.35	0.11	0.43
V	0.29	0.59	0.44	0.55	0.50	0.45	0.52	0.38	0.55	0.57	0.50	....	0.62	0.52	....	0.41	0.56	0.25	0.37	0.51
VI	0.15	0.68	0.56	0.68	0.53	0.50	0.58	0.51	0.66	0.64	0.56	....	0.75	0.60	....	0.69	0.60	0.30	0.45	0.67
Mean.....	0.28	0.52	0.49	0.58	0.47	0.45	0.51	0.42	0.61	0.48	0.45	....	0.57	0.50	....	0.49	0.46	0.30	0.31	0.54
SD.....	0.11	0.17	0.05	0.09	0.05	0.04	0.05	0.06	0.06	0.17	0.12	....	0.17	0.09	....	0.15	0.17	0.04	0.15	0.10

Dearborn Total with Myers is 0.51, while the mean correlations Dearborn with all tests is 0.44. It should be noted also that correlations of Dearborn with the verbal tests become distinctly lower after grade VI, whereas the correlation or Dearborn with Myers shows no marked change. The correlations of Dearborn Total and the composite of achievement show a steady decline from 0.61 for grade IV to 0.20 for grade VIII.

So far as these data are concerned, there is a clear indication that the non-verbal material becomes less valid for the prediction of success in school subjects as the school grade becomes higher.

4. *Simple, Partial and Multiple Correlations of Achievement with Stanford Mental Age, Group Tests and School Attitude.*—The variable "school attitude" was obtained by averaging the judgments of from six to eleven members of the school staff. Using a rating scale of five steps, the teachers independently rated the pupils they knew well for a composite of traits such as *application, earnestness, willingness, effort.* The variable "group test" is the average of the correlations of all tests except the Myers. The criterion is the composite of achievement in school subjects. The r's given are the averages of the correlations for grades IV, V and VI. These, together with the partial and multiple correlations (Kelley's formulæ), are given in Table VII.

TABLE VII.—SHOWING THE SIMPLE, PARTIAL AND MULTIPLE CORRELATIONS BETWEEN VARIABLES (1) COMPOSITE OF ACHIEVEMENT (2) STANFORD MENTAL AGE (3) MEAN GROUP TESTS, AND (4) SCHOOL ATTITUDE

1 Simple correlations	2 Partial correlations first order	3 Partial correlations second order
$r_{12} = 0.54$	$r_{12.3} = 0.36$	$r_{12.34} = 0.32$
$r_{13} = 0.52$	$r_{12.4} = 0.47$	$r_{13.24} = 0.31$
$r_{14} = 0.32$	$r_{13.2} = 0.32$	$r_{14.23} = 0.12$
$r_{23} = 0.55$	$r_{13.4} = 0.47$	
$r_{24} = 0.40$	$r_{14.2} = 0.14$	
$r_{34} = 0.30$	$r_{14.3} = 0.21$	4
	$r_{23.4} = 0.49$	Multiple correlations
	$r_{23.4} = 0.49$	$r_{1.23} = 0.605$
	$r_{24.3} = 0.30$	$r_{1.234} = 0.611$
	$r_{34.2} = 0.10$	

From column 1 it appears that, in these grades, the Stanford Mental Age gives about the same simple correlation (0.54) with achievement as the average Group Test (0.52). School Attitude gives a considerably lower coefficient—0.32.

What we want to know more exactly is whether these three variables correlate with achievement by measuring very much the same group of abilities, or whether each contributes something unique, so that by properly combining them, the composite will give a correlation much higher than that given by any one alone.

First, the partial correlations of the Stanford Mental Age and the Group Tests with achievement will be considered. The correlation of Achievement with Mental Age is 0.54, and the partial correlation (See column 2, Table VII) between Achievement and Mental Age, with Group Tests eliminated, is 0.36, and the partial correlation of Achievement with Mental Age, both Group Tests and School Attitude held constant is 0.32. This means that, to a considerable extent, the Mental Age and Group Tests measure the same group of abilities, although each measure certain abilities, correlated with achievement, which are unique. The practical value of each is perhaps more clearly indicated by the Multiple Correlations (column 4, Table VII). Here it appears that when the Stanford Mental Age and Group Tests are perfectly combined by use of weights obtained by the regression equation, the multiple correlation is 0.605 as compared to 0.54 or 0.52, which Mental Age or the Group Test, respectively, alone gives. The addition of 0.07 or 0.09 to correlations of these magnitudes is important.

The variable "School Attitude" has received so much discussion in recent literature that it merits careful consideration.

School Attitude is positively associated with Mental Age ($r = 0.40$) and with Group Tests, although not quite so closely ($r = 0.30$). The correlation of School Attitude with Achievement (0.32) is little higher than that between School Attitude and Group Tests. It is possible that this correlation with achievement is wholly, or almost wholly, due to the fact that "School Attitude" as judged by our teachers, and intelligence as measured by our tests are identical, in part. A careful study of the various partial correlations shows this to be true. When the elements of Mental Age and Group Tests which are identical with School Attitude are eliminated ($r14 - 23$), the residual of school attitudes gives a correlation with Achievement of but 0.12. The unique factors add very little to a composite of Mental Age and

Group Tests when each is properly weighted: the multiple r, achievement with (Mental Age + Group) is 0.605, and the multiple r, achievement with (Mental Age + Group × School Attitude) is 0.611.

It should not be considered that these facts greatly minimize the importance of school attitudes. The significant thing is that in so far as the School attitudes affect achievement in school work, they are almost completely measured by the intelligence tests. The Stanford-Binet measures these attitudes a little better than the group tests (the partial correlations $r_{14.2} = 0.14$, $r_{14.3} = 0.21$); both tests together account for them almost entirely.

These facts may be taken by some to support the doctrine that *interest, application* and the like, are in general, a sympton of intelligence—a *result* of successful functioning rather than a *cause* of it. The truth may be, however, that intelligence, as many seem to conceive it, and application, etc., as here estimated, are quite distinct, and that each contributes to success in the tests just as it does to success in school work.

The perfectly combined results of group tests, individual tests and school attitude fall far short of perfect correlation with achievement. What factors are reponsible cannot be discerned, at present, with certainty. The restriction of range in our groups and various defects in the instruments tend to reduce the correlations.

Two other possibilities will be suggested in the next section: (1) Specialization of abilities in school subjects, and (2) differences in the emphasis placed upon subjects by different schools.

(*To be concluded in May*)

ONE ELEMENT IN THE PROBABLE ERROR OF A MENTAL AGE MEASUREMENT

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The point I wish to make in the following paragraphs is this: In any measurement of mental age made by means of a scale whose units are relatively large (such as the Binet Scale, in which the smallest unit is 2 months) there is, in addition to other sources of error, an error due to the fact that the scale proceeds by steps instead of being continuous. The size of this error is dependent on the size of the steps in the scale, its least possible median value being that of half of one step. In the Stanford Revision of the Binet Scale, in which the unit varies from 2 months at the lower end to 6 months at the upper end of the scale, the minimum for this median error (or probable error) of a single measurement varies accordingly from 1 month at the lower end to 3 months at the upper end of the scale. Moreover, the error from this source always lowers the obtained mental age from its true value.

To make this clear, we may suppose a case in which this element of error is as small as possible—the case in which mental growth regularly parallels the scale, so that once every 2 months a new test is passed. Take for instance a normal child of 6 who is able to pass all the tests through Year VI, and none beyond this. His true IQ we will say, is 100 precisely. Just at the end of each 2-month period he becomes able to pass one more test (in Year VII or beyond) than he could before. Then at 6 years 2 months he would (if tested) measure 6–2, at 6 years 4 months he would measure 6–4, at 6 years 6 months he would measure 6–6, etc., and at each of these points his IQ would be 100. Between these points also his true IQ is 100, but would our measurement give this result? Suppose he were tested at the age of 6 years 1 month. He has not yet become able to pass another test—he is still a month away from it. He would still measure 6–0, and his apparent IQ would be 99. Just before he becomes 6–2, he would still test 6–0, and his apparent IQ would be 97. In other words, since there is no possible mental age between, for instance, 6–0 and 6–2,[1] there must occur somewhere (just as the child becomes able to pass another test) two successive days on one of which his mental age is 6–0 and on the other of which it is 6–2. By our assumption, his chronological

[1] Half credit on test 4, Year VII (tying bowknot) permits a single exception to this statement.

TABLE I

After	CA	MA	IQ
2 weeks	6–0	6–0	100
4 weeks	6–1	6–0	99
6 weeks	6–1	6–0	99
8 weeks	6–2	6–0	97
2 months	6–2	6–2	100

age on these two days is 6 years 2 months. His apparent intelligence quotient, which at 6 years exactly was 100, has gone down week by week to 97. It now jumps to 100 again. (See Fig. 1.)

When measured by a scale whose unit is 2 months, a child's mental development must appear to proceed discontinuously, shooting up suddenly at least 2 months at a time. When it happens that he reaches the point of success in two or three tests simultaneously, his gain will appear as 4 months, or as 6 months, at one time. It is not probable that this often happens in a single day, but perhaps not infrequently within a week or two, so that mental age, as measured, may legitimately increase 6 months or more within a few weeks,—or, on the other hand, 6 months or more may go by in which it happens that a child passes by none of these critical points which increase his measured mental age. In the latter case, for six months or more his IQ appears to be decreasing, for his chronological age is increasing, while his measured mental age is constant.

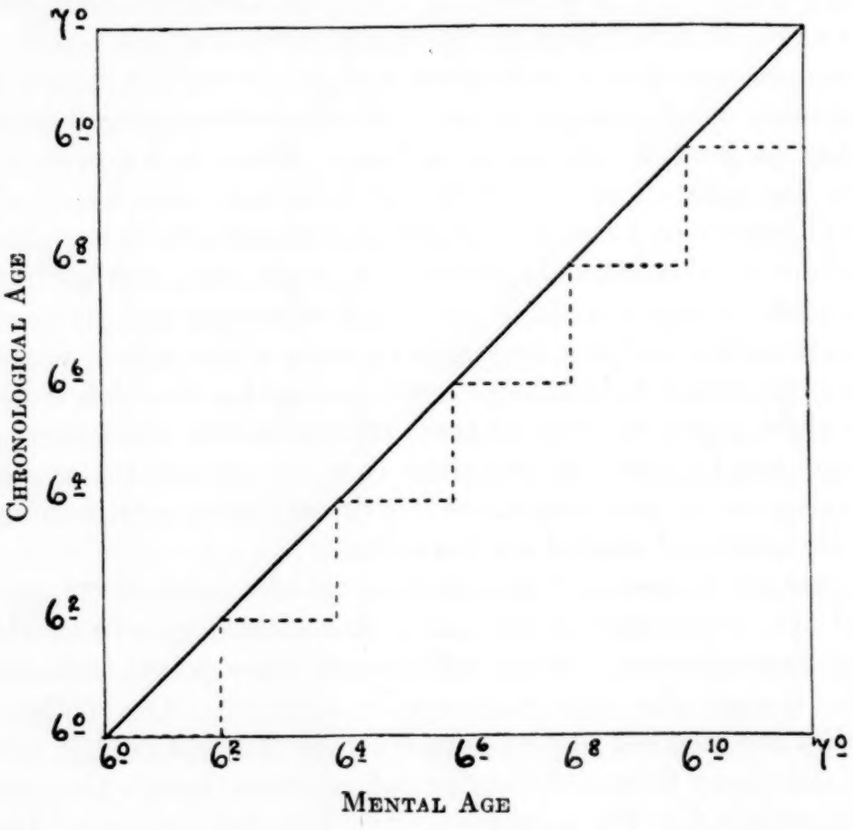
We are not to assume, however, from this discontinuity of measured mental age, dependent on the scale, that mental growth in children is itself discontinuous. What evidence we have points to continuous growth, though the rate may not be constant. Our child whose mentality becomes 6–2 just when he is 6 years 2 months old, is mentally only 1 day away from 6–2 the day before, even though his measured mental age is 6–0. The measurement on that day may be said to have an "error" of 2 months—an error whose existence may be laid to the presence of steps in the scale, and whose size corresponds to their size. On the next day the corresponding error is 0, since he now passes the test. One month hence the error will be 1 month; 2 months hence, again 2 months; 2 months and a day hence it will again be 0. In this case, where a rate of growth has been assumed for the child that will correspond as closely as possible to the scale, so as to give the *least possible* error, there still remains an inevitable error which varies in

FIGURE 1.

————RELATION BETWEEN CHRONOLOGICAL AGE AND TRUE MENTAL AGE, WHEN IQ = 100 AND GROWTH IS REGULAR.

– – – – – –RELATION BETWEEN CHRONOLOGICAL AGE AND MEASURED MENTAL AGE, WHEN IQ = 100 AND GROWTH IS REGULAR.

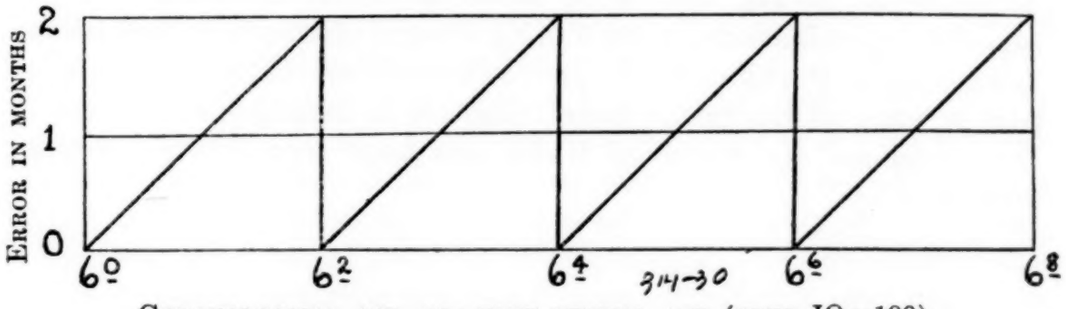
AT ANY POINT VERTICAL DISTANCE BETWEEN TWO LINES REPRESENTS ERROR DUE TO SIZE OF STEPS IN THE SCALE.



regular periods from 0 to 2 months, as illustrated in the diagram below (Fig. 2), and always reduces the measurement.

It is obvious from this diagram that, since a child is equally likely to be examined at any age point, in half the cases the error will reach above and in half the cases it will fall short of the horizontal line drawn at 1 month—in other words, the median error here represented is 1 month. This is the minimum probable error due to size of scale units from Year III through Year X. Beyond Year X this minimum error increases as the steps of the scale increase in size, approaching its highest value of 3 months (due to this cause alone) when an individual who is growing is failing on those tests alone which appear in Year XVIII and count for 6 months each.

FIGURE 2.



CHRONOLOGICAL AGE AND TRUE MENTAL AGE (TRUE IQ = 100)

It must very seldom be the case, however, that our assumption is true, *i.e.*, that a child grows in just the way that will bring it about that he is able to pass a new test (*i.e.*, one on which up to that time he would have failed) at regular intervals. He may reach the critical point in regard to several tests within a few weeks, or within 6 months, and then go on for 6 months without passing any such points. The farther the departure from regularity in this respect, the greater becomes the range of error (and the median error) dependent on size of scale units. Until we know what degree of irregularity is usual, it is not possible to say exactly how great is the median error (or probable error) due to this cause; but until we have a scale with smaller units it can never at the lower levels be less than 1 month, nor at the upper levels less than 3 months.[1] It is not improbable that the true figures may be more than twice as large.

[1] When only half the scale is considered, the part of the PE under discussion is doubled. When the four starred tests instead of all six are used in each year, it is increased 50 per cent.

Here, then, is a factor which, together with change in type of content from one part of the scale to another, unavoidable variations in the giving of the tests, and personal reaction between examiner and child, is always present in the total PE of a mental age measurement. This total PE has been reported to range from approximately 3 months at the lower end of the scale to approximately 6 months at the upper end.

If, on the other hand, we wish to determine how great a difference might in extreme cases be brought about by this cause, an estimate only is possible. It is readily conceivable that occasionally a child may be tested by the standard procedure and obtain a mental age which, had he been measured a week or two later, would have been as much as a year higher. This, at chronological age 6, means 16 points difference in the IQ. Occurring in the first or in the second of two separated examinations, it could bring about a discrepancy, upward or downward, of 16 points if not more, and may account for the whole or part of some of the rather large "changes in intelligence quotient," the occasional occurrence of which has been reported by various investigators.

DISPARITY BETWEEN INTELLIGENCE AND SCHOLARSHIP

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Even were intelligence and potential scholarship to correlate perfectly, there would always be cases of disparity between intelligence and scholarship grades: for the idlers, the men with excessive extra-curricular burdens, the men with unhealthy bodies or unhealthy philosophies of life skew the correlation on the one hand; and the men with unusual pertinacity or disproportionate absorption in scholarly performance upset calculations on the other hand. Any statement regarding the validity of a test as a predictive measure is premature, or speculative, until the disparity has been measured and some of the factors related to the disparity ascertained.

In a study of this problem with the class of 1924 at Dartmouth, the scholarship averages of the first semester were converted into percentiles, and likewise the intelligence ratings as determined by Alpha. The difference, in the case of each student, between the two percentiles was taken as the measure of discrepancy. On the basis of such computations, including 600 cases, it was found that over half of the class had discrepancies of less than 20 per cent, or 20 points on the percentile rating.

Discrepancy	Cases	Per Cent
0	13	2.2
1– 9	161	26.8
10–19	141	23.5
20–29	96	16.0
30–39	67	11.2
40–49	60	10.0
50–59	36	6.0
60–69	15	2.5
70–79	7	1.2
80–89	4	0.7

Of the 62 cases with discrepancies of 50 per cent or over, 53 remained in college during the second semester. It was decided to give tests to these men to measure their assimilation of the environment, their tension and persistence of work, and their power of aggressiveness. As a control group, 45 men who showed not over 2 per cent dis-

crepancy between Alpha score and scholarship were summoned with the other group. Of the 98 men summoned, 87 appeared to take the tests.

To measure tension of their normal work, a modification of the Downey will-profile test was given: The subject was asked to write the phrase "The American Legion" at his usual rate and in his usual style, then to write it as rapidly as possible. The speeded time divided by the normal time gave a quotient which was regarded as a measurement of his usual tension. To measure perseverance, the same phrase was written as slowly as possible, and this time divided by the normal time.

For the measurement of the degree to which he had assimilated the environment, an abbreviated form of the Rosanoff, Martin, and Rosanoff High Standard Frequency Test was given. As each of the 50 words was read, the subject was asked to respond with the first word that came to his mind. This response was evaluated on the basis of the number of men out of a group of 100 eminent men of science who gave this identical response. The total score is merely the sum of these values.

For the aggression measurement the following procedure was used. Three tests were given in this order, one to measure fear, one to measure, sex, and one to measure pugnacity or aggression. With three such tests, the first would surely render all necessary service as a shock-absorber or technique-developer, so that the later tests would be a more accurate measure of the instinct. The tests themselves consisted of stories of about 290 words meant to appeal conspicuously to the instincts, respectively, of fear, sex, and aggression. Scattered variously throughout the story were 20 words obviously unrelated to the story. The subject was told to cross out every word not belonging to the story. The time taken on each test was assumed to be a measurement of the strength of the instinct: for the more appealing the story the more likely were excursions into related imagery; and the greater disconcertion caused by the intruding words would, in all probability, make reorientation to the trend of thought more difficult and slow. The time taken by the subject on the aggression test was then divided by the total time of the three tests combined. This quotient seemed to be the most accurate measure: For the normal rate of reading would vary in the different individuals, and such variation between individuals would be eliminated by a quotient. If the introspections of the subjects may be trusted, these tests did not cause

the desired effects: Many reported that they were unaroused by the story as they rushed through it to delete the irrelevant words, but were thrilled after the test as they reread the passage for the story.

In the correlations there were marked divergences between the control group and the discrepancy group in only two of the five measurements:

	Control	Discrepancy
With scholarship		
r normal speed of writing	0.097 ± 0.104	0.609 ± 0.064
r Rosanoff High Speed Frequency	0.632 ± 0.063	0.002 ± 0.103
With intelligence		
r normal speed of writing	0.123 ± 0.103	0.036 ± 0.101
r Rosanoff High Speed Frequency	0.643 ± 0.062	0.181 ± 0.100

Since the group with discrepancies included both those with scholarship averages superior and those with scholarship averages inferior to Alpha rating, scores in each of the measurements were correlated with the differences between percentiles of scholarship and intelligence, from negative to positive. The data showed that normal speed of writing correlated 0.131 ± 0.100 with scholarship superiority; tension 0.185 + 0.98 with scholarship superiority; perseverance 0.055 ± 0.101 with scholarship superiority; high standard frequency 0.131 ± 0.101 with intelligence superiority; and aggressiveness 0.016 ± 149 with scholarship superiority.

All of these latter correlations are low, but their tendencies seem to justify the assumption that discrepancies in favor of scholarship may be measured by some sort of perseverance or tension test, and discrepancies in favor of intelligence by some test which measures facility in absorbing the environment. Such tests deserve investigation.

No attempt was made to gather data regarding men's estimates of their industriousness or facility. Such data might be of accessory service, but should of course be subject to the usual scientific prescription, *cum grano salis*.

Possibly a "shock-absorber" for the intelligence test might be constructed on the basis of the Downey tension idea, with certain material to be copied at normal speed and other material to be copied

at full speed, the score being measured in units of amount copied rather than in units of time. Likewise much material from the Rosanoff High Standard Frequency Test might be incorporated into the information test. In all, it seems highly possible to incorporate within a single group test material to measure both mental abilities and the chief factors accessory to those abilities.

NOTES ON ARTICLES IN EDUCATIONAL PSYCHOLOGY IN CURRENT ISSUES OF OTHER MAGAZINES

Intelligence Tests

Intelligence Tests and the Classification of Pupils. F. S. Breed and E. R Breslich. The School Review, 1922, March, 210–216. Report of an investigation conducted to determine how well intelligence tests predict the educational achievement of high school pupils. Tests used were Otis, Chicago, and Terman Group Tests; Hotz Algebra Tests; and special school tests in arithmetical ability. Tests provide basis for temporary classification only.

Intelligence as a Factor in School Progress. I. N. Madsen. School and Society, 1922, March 11, 283–288. Retardation and acceleration among 12,182 children, grades III to XII as shown by Army Alpha and Haggerty Group Tests.

A Comparison of the Brightness of Country and City High School Children. James H. Hinds. Journal of Educational Research, 1922, February, 120–124. Results of administering the Otis Test to 454 city children and 59 small town children and 68 country children. Country child lower in mentality.

Prevention of the Lockstep in Schools. L. W. Cole. School and Society, 1922, February 25, 211–217. Differences in mental age among kindergarten and first grade children as shown by the Cole Vincent Group Intelligence Test for School Entrance. Comparisons with Binet Mental Age. Eight tables.

Suggested Studies in the Field of Mental Testing. Arthur S. Otis. Journal of Educational Method, 1922, February, 220–232. Enumeration and discussion of 8 research problems as suggestions to teachers and administrators. Help in undertaking the researches is offered by the writer.

Miscellaneous

A Method of Commensurating Mental Measurements. Harry S. Will. Journal of Educational Research, 1922, February, 139–153. A description of a new method called the "kental," for precise comparison of scores in a series of tests in various subjects. A comparison of the "kental" and the Galton percentile.

Administrative Problems Connected with Gifted Children. John C. and J. L. Almack. Educational Administration and Supervision, 1922, March, 129–136. Description of the selection of superior children in Eugene, Oregon. Problems met by administrators.

The New Knowledge of Spelling. C. H. Ward. The English Journal, 1922, February, 78–88. "Trouble Spots" in spelling in the high school. Causes and suggestions for improvement.

Vocational Guidance in the Junior High School. Frederick Schultz. Educational Review, 1922, March, 238–246. Suggestions for solving the problems of real vocational guidance.

Arithmetic Ability of Men in the Army and of Children in the Public Schools. Arthur Kolstad. Journal of Educational Research, 1922, February, 97–111. Comparison of the scores made on Test 2 of the Army Alpha by 2500 adult men, 632 children, grades 4 to 8, and 725 normal school students. Details shown in 5 Tables and 3 Diagrams.

Coercion and Learning. Wm. H. Kilpatrick. Journal of Educational Method, 1922, February, 233–239. Final installment of a popular discussion of the laws of learning.

Lost in Concrete Instances—Many Learners. Garry C. Myers, Journal of Educational Research, 1922, February, 135–138. A warning to teachers to make sure that pupils grasp the principles involved in concrete illustrations of abstractions.

Standards for the English Teacher. Allan Abbott. English Journal, 1922, February, 69–77. An address given before the National Council of Teachers of English. A proposal for setting up standard tests of teacher attainment. Details of program for preparing a series of standard tests.

NEW PUBLICATIONS IN EDUCATIONAL PSYCHOLOGY AND RELATED FIELDS OF EDUCATION

1. *Developing Mental Power*, a monograph of the Riverside series by G. M. Stratton,[1] is as delightful and stimulating a book for teacher as has appeared since James' Talks. Reviewing the extreme views on mental training, the mental disciplinarians and the doctrine of "contents," the author submits that both have missed the truth. It is urged that the mind is unified and although its parts are distinguishable they are closely related. The mind while particularized in ability is whole and fluid. The development of mental power is to be achieved by practice in control of the instincts, emotions, and the will, together with the acquisition of appropriate bodily and mental habits. Children must learn, through practice, to do the irksome, to be persistent and steady, to use caution and forethought, to develop reverence, taste, cheerfulness, courtesy, honesty. Many "exercises" for the care and training of the instincts, emotions and will are given, not on the disciplinarian assumption of the virtue of unpleasant and useless tasks since "the mind can strengthen on what is of service and delight, of which there is enough, without incessant treadmill work. Better to paint the ship, for discipline, than to knock rust off the anchor." Every teacher should spend an evening with this sane and stimulating essay which does not emphasize knowledge less but character more.

A. I. G.

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2. *An Advanced Text in Systematic Psychology.*—Psychologists "are giving their time and attention almost entirely to the development of the experimental method and the discovery of individual facts by its means, to the serious neglect of the broader significance of these facts." In making this statement Mr. Moore, in the introduction of his book,[2] is stating an opinion frequently voiced by psychologists

[1] Stratton, H. M.: "Developing Mental Power." Houghton, Mifflin Co., Boston, 1922, pp. X + 77.

[2] Moore, Jared Sparks: "The Foundations of Psychology." Princeton University Press, Princeton, 1921, pp. XIX + 239.

themselves in recent conventions. Moore's work, aside from Boris Sidis' *The Foundations of Normal and Abnormal Psychology*, is about the only book attempting to evaluate the relations of psychology as a system, to the great problems of philosophy and of the natural and mental science. It differs markedly from the available histories of pscyhology and although written by a philosopher, it is primarily a discussion of the definitions and concepts of different schools of psychology and the postulates necessary for the construction of a scientific pscyhology, with special attention to the problems of parallelism, psychical causation and the subconscious. It is a good basal text for courses in systematic psychology.

A. I. G.

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3. *A New Advanced Text on the Nervous System* by Tilney and Riley[1] is without doubt more comprehensive than any other printed in English. While it is written primarily as an introduction to the study of nervous diseases, it supplies many needs of the advanced student of psychology. It differs from the conventional texts in giving relatively large space to a discussion of the functions of nervous mechanisms. The various "syndromes" *i.e.*, complexes of symptoms, due to disease or destruction of nervous structures are described in detail together with treatments of the evolutionary significance, the relations, surface appearance, anatomy, histology, extirpation and stimulation experimental data with reference to each division of the system. The illustrations, photographic and diagrammatic, are numerous and admirably instructive.

The authors indulge infrequently in speculations concerning the nature, origin and localization of mental traits and such hypotheses offered are reached "by the direct and practical approach of clinical experience." "All areas of the brain outside of the frontal lobe are purely cognitive in their activity." As cognitude functions they discuss sensation, perception, "knowledge of external things." But every cognitive process "has attached to it some affective value." It is believed that the thalamus is the "site of the primary emotions and acts as that part of the brain primordially concerned in feeling tone." In the elaboration of feeling and primary emotions into "binary and tertiary combinations such as loathing, contempt, etc.,"

[1] Tilney, Frederick and Riley, Henry A.: "The Form and Functions of the Central Nervous System." Paul B. Hoeber, New York, 1921, pp. XXIV + 1020.

the procedure of McDougall in obviously followed. "*Knowing* must be activated by feeling before volitional reaction occurs." "If search were made among the various areas of the brain to determine the most likely place for the elaboration of these complex syntheses, the frontal lobe would doubtless be selected as best fitted for such process" —how reminiscent of Wundt's remarks nearly a half century ago!

Whether the reader will approve of Tilney and Riley's analysis of mental states or not, the book is a masterly treatise which may be studied with profit by the advanced student of physiological psychology.

A. I. G.

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4. *Psychology in Industry.*—James Drever whose *Psychology of Everyday Life* has been recently reviewed in this journal is the author of a popular account of industrial psychology.[1] Chapters on intelligence testing, trade testing, fatigue, work and rest periods, motion study, external conditions, and the like, are written with an effort at clearness and simplicity. While the book contains no original contributions, it will serve as a useful introduction to study in this field.

A. I. G.

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5. *A Readable Text for the General Worker in Mental Measurement.*[2]

In this volume the author has brought together in unusually readable form practically all the techniques needed by the average worker in the field of mental measurement. The book is divided into three parts, each complete in itself, and followed by a list of supplementary readings. Part 1 (Chapters I–VI) deals with the place of scientific measurement in education and its uses in classification, diagnosis, teaching, evaluating efficiency of instruction, and vocational guidance. Part 2 (Chapters VII–XI) presents detailed instructions for the construction and standardization of tests. Part 3 (Chapters XII–XVII) is concerned with the application of statistical methods to test data and with the use of tabular and graphic methods in the effective presentation of results. An appendix gives the chief centers for the distribution of tests.

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[1] Drever, James.: "The Psychology of Industry." E. P. Dutton & Co., New York, 1921, pp. XI + 148.

[2] McCall, Wm. A.: "How to Measure in Education." The Macmillan Co., New York, 1922, pp. XII + 416.

Forty-eight Tables and 35 Diagrams interspersed throughout the text illustrate clearly the principles involved and the methods used.

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The Lincoln School of Teachers College.

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6. *A New Yearbook.*[1]—The National Society for the Study of Education has presented a timely discussion of intelligence tests in the Twenty-first Yearbook. Thorndike's introductory chapter on "Measurement in Education" is followed by Colvin's on "The Principles Underlying the Construction and Use of Intelligence Tests." In the first part of the next chapter, Rugg has presented elementary methods of treating test data so lucidly that "he who runs may read," and then demonstrates his versatility by devoting twelve pages to a critical discussion of the newer developments and applications of statistical methods, supplemented by a classified and annotated bibliography. In Chapter IV Whipple presents in tabular form condensed information concerning 46 tests, under the following headings: The compiler, composition, range of ages or grades covered, time to apply, number and nature of test elements, publisher, prices and references.

In Part II of the Yearbook the various practical uses of intelligence tests are discussed. The introductory chapter is general. Chapters II and III show how the intelligence testing program functions in the schools of Detroit and Jackson, Michigan respectively. The remaining chapters deal successively with the measurement of intelligence in the lower primary grades, the elementary school, the junior and senior high schools, normal schools, colleges and universities.

The Yearbook is an exceedingly valuable compendium and guide for those who realize the place of group tests of intelligence in the administration of schools. It should also stimulate critical selection and evaluation of tests and methods of treating data.

The Committee[2] is to be congratulated both on the quality and

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[1] Intelligence Tests and Their Uses. *The Twenty-first Yearbook of the National Society for the Study of Education.* Prepared by the Society's Committee and edited by Guy Montrose Whipple. Public School Publishing Company, Bloomington, Illinois, 1922, pp. IX + 289.

[2] The Committee was composed of the following members, all of whom contributed to the Yearbook: Stephen S. Colvin, Chairman, Helen Davis, Bessie Lee Gambrill, Henry W. Holmes, Warren K. Layton, W. S. Miller, Rudolph Pintner, Agnes L. Rogers, Harold Rugg, M. R. Trabue, E. L. Thorndike, G. M. Whipple.

range of the materials it has brought together. The tone of the discussion is at no point controversial. The Yearbook should demonstrate the significance of the movement in question and save it from the disastrous effects of extravagant claims and fears.

L. Z.

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7. *A Manual for Case Study* which is extremely compact yet definite and complete has been recently published by the California Bureau of Juvenile Research.[1] Comprehensive instructions, with sample data, are given for taking case histories of intelligence, temperament, physical condition, moral character, conduct, amusements, education, home conditions, etc., etc. Chapters are devoted to the scope and meaning of social case investigation, methods (such as interviews, correspondence, inspection of records, etc.), methods of evaluating data, the use of charts, symbols, etc. It contains tables of norms of height, weight, complete sample histories and excellent lists of references on each topic discussed. This booklet, which can be purchased for a quarter, merits use in normal school and college classes and could be studied profitably by educational workers in general.

A. I. G.

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[1] Williams, J. Harold and Others: *Whittier Social Case History Manual. Whittier, Cal.* California, Bureau of Juvenile Research, *Bulletin* No. 10, Dec. 1921, pp. 98.

ADDITIONAL PUBLICATIONS RECEIVED

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Drever, James. *The Psychology of Everyday Life.* New York: E. P. Dutton & Co., pp. IX + 164.

Drever, James. *The Psychology of Industry.* New York: E. P. Dutton & Co., pp. XI + 148.

Dunn, Fannie Wyche. *Interest Factors in Primary Reading Material.* New York City: Teachers College, Columbia University, 1921, pp. 70.

Hingley, R. H. *Psycho-Analysis.* New York: Dodd, Mead & Co., 1922, pp. VI + 190.

MacPherson, William. *The Psychology of Persuasion.* New York: E. P. Dutton & Co., pp. 256.

Toops, Herbert Anderson. *Trade Tests in Education.* New York City: Teachers College, Columbia University, 1921, pp. VI + 118.

Voelker, Paul Frederick. *The Function of Ideals and Attitudes in Social Education.* New York City: Teachers College, Columbia University, 1921, pp. 126.

B. Mental and Educational Tests

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Breitweiser, J. V. *The Thorndike College Entrance Tests in the University of California.* Berkeley: University of California Press, 1921, pp. 17.

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C. PUBLICATIONS IN THE GENERAL EDUCATIONAL FIELD

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JUDD, CORNELIUS D. *The Summer School as an Agency for the Training of Teachers in the United States.* Nashville: George Peabody College for Teachers, 1921, pp. 88.

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PHELPS, SHELTON. *The administration of County High Schools in the South.* Nashville: George Peabody College for Teachers, pp. 153.

ROSENBERGER, NOAH BRYAN. *The Place of the Elementary Calculus in the Senior High-School Mathematics.* New York City: Teachers College, Columbia University, 1921, pp. VII + 80.

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University of Pennsylvania. *Eighth Annual Schoolmen's Week Proceedings.* Philadelphia: University of Pennsylvania, 1921, pp. 325.

WEBB, HANOR A. *General Science Instruction in the Grades.* Nashville: George Peabody College for Teachers, 1921, pp. 105.

William McGuffy School. *Studies in the Geography of Europe.* Miami: University of Miami, 1920, pp. 85.

Wilson. G. M. *Connersville Course of Study in Mathematics.* Baltimore: Warwick & York, Inc., 1922, pp. 110.

D. New School Textbooks

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E. Miscellaneous Publications

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Dudley, W. H. *Organization for Visual Instruction.* Bureau of Education, Washington. Bulletin No. 7, 1921, pp. 24.

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F. Publications of United States Bureau of Education

1. List of Publications available 1921.

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Bulletin No. 20, 1921, *Developments in Nursing Education since* 1918.
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Bulletin No. 39, 1920, *Facilities for Foreign Students in American Universities.*
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G. Miscellaneous Pamphlet Material

1. American Academy of Political and Social Science. The Annals, November, 1921. *Child Welfare.* 10 Depot Street, Concord, N. H.

2. BLUMGART, LEONARD. *Observations on Maladjusted Children.* National Committee for Mental Hygiene, New York City, 1921.
3. GOODLANDER, MABEL R. *Education Through Experience: A Four Year Experiment in The Ethical Culture School.* Bureau of Educational Experiments, 16 West 8th Street, New York City, 1921.
4. MARTIN, LILLIEN J. *Pedagogical Hints from the Results of a Survey of a San Francisco Public School for Delinquent Boys.* Martin Mental Hygiene Publication, No. 5.
5. *United States Interdepartmental Social Hygiene Board,* Annual Report for 1921.

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